HIGHLIGHTS

REVISION NO. 33 Jun 01/10

Pages which have been revised are outlined below, together with the Highlights of the Revision

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY

CHAPTER 75

L.E.P. 1- 5 Revised to Reflect this revision indicating new,revised, and/or deleted pages

CHAPTER 75

AIR

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively
Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary

CH/SE/SU	C	PAGE	DATE
RECORD			
OF TEMP.			
REVISION			
L.E.P.	R	1- 5	Jun01/10
T. of C.		1	Jun01/04
T. of C.		2	Dec01/06
T. of C.		3	Jun01/08
T. of C.		4	Dec01/06
T. of C.		5	Dec01/06
T. of C.		6	Jun01/04
T. of C.		7	Jun01/04
75-00-00		1	Dec01/06
75-00-00		2	Jun01/04
75-00-00		3	Jun01/04
75-00-00		4	Dec01/06
75-00-00		601	Jun01/04
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75-00-00		618	Jun01/04
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75-23-05		401	Jun01/04
75-23-05		402	Jun01/06

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
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75-23-05		406	Jun01/06	75-23-08		403	Dec01/06	75-23-09		438	Jun01/04
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75-23-07		403	Jun01/04	75-23-08		413	Dec01/06	75-23-09		448	Jun01/04
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75-23-07		423	Jun01/04	75-23-09		417	Jun01/08	75-23-09		468	Dec01/06
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CH/SE/SU	C	PAGE	DATE
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CHAPTER 75

AIR

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1. General
For Phase I Engine Configuration (Ref. Fig. 001)

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

For Phase III Engine Configuration (Ref. Fig. 002)

**ON A/C 101-200,

The engine air system is made up of : Nacelle accessory cooling systems ; automatic turbine rotor clearance control system including turbine case cooling and turbine cooling air system ; compressor thermatic control (only for phase I engine configuration) ; compressor bleed control system including 2.5 bleed system and 2.9 bleed system.
The engine air system provides for airflow cooling to keep the temperature of the engine compartments and components within the required limits.
In addition engine air bleeds are used for :
- Environmental control system (ECS) 8th and 15th stage bleeds for cabin air.
- Thrust reverser control and pneumatic power : 15th stage bleed.
- Nacelle anti-ice : 8th stage bleed.
- Hydraulic tank pressurization : 15th stage bleed.

A. Accessory Cooling
The accessory cooling system removes excess heat from the engine and nacelle components and compartments by providing the ventilation air required for :
- IDG air/oil heat exchanger
- Engine air/oil heat exchanger
- No. 3 bearing compartment
- Nacelle core compartment and components.

B. Automatic turbine rotor clearance control system (ATRCCS) supplies fan bypass air to the outside of the high and low turbine cases. This system effectively reduces turbine rotor clearances during specific modes of flight operator.

C. In phase I engine configuration the thermatic rotor control system (TRC) reduces engine fuel consumption at cruise conditions by turning off cooling air to the interior of the high pressure compressor.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

C. Not applicable for phase III engine configuration.

**ON A/C 101-200,

D. Turbine cooling air system (TCA) supplies 12th stage air for internal cooling of the high pressure turbine second stage blades and vanes.

E. Compressor Stability Control
To permit compressor stability during starting and engine operation, the engine incorporates : two compressor bleed systems :
- High compressor interstage air bleed system (station 2.9).
- Low compressor discharge air bleed system (station 2.5).

F. Other Systems
Air conditioning (Ref. 21-00-00) and precooler (Ref. 36-11-00) nacelle anti-ice (Ref. 30-21-00). Reversers (Ref. 78-31-00) hydraulic pressurization (Ref. 29-14-00).

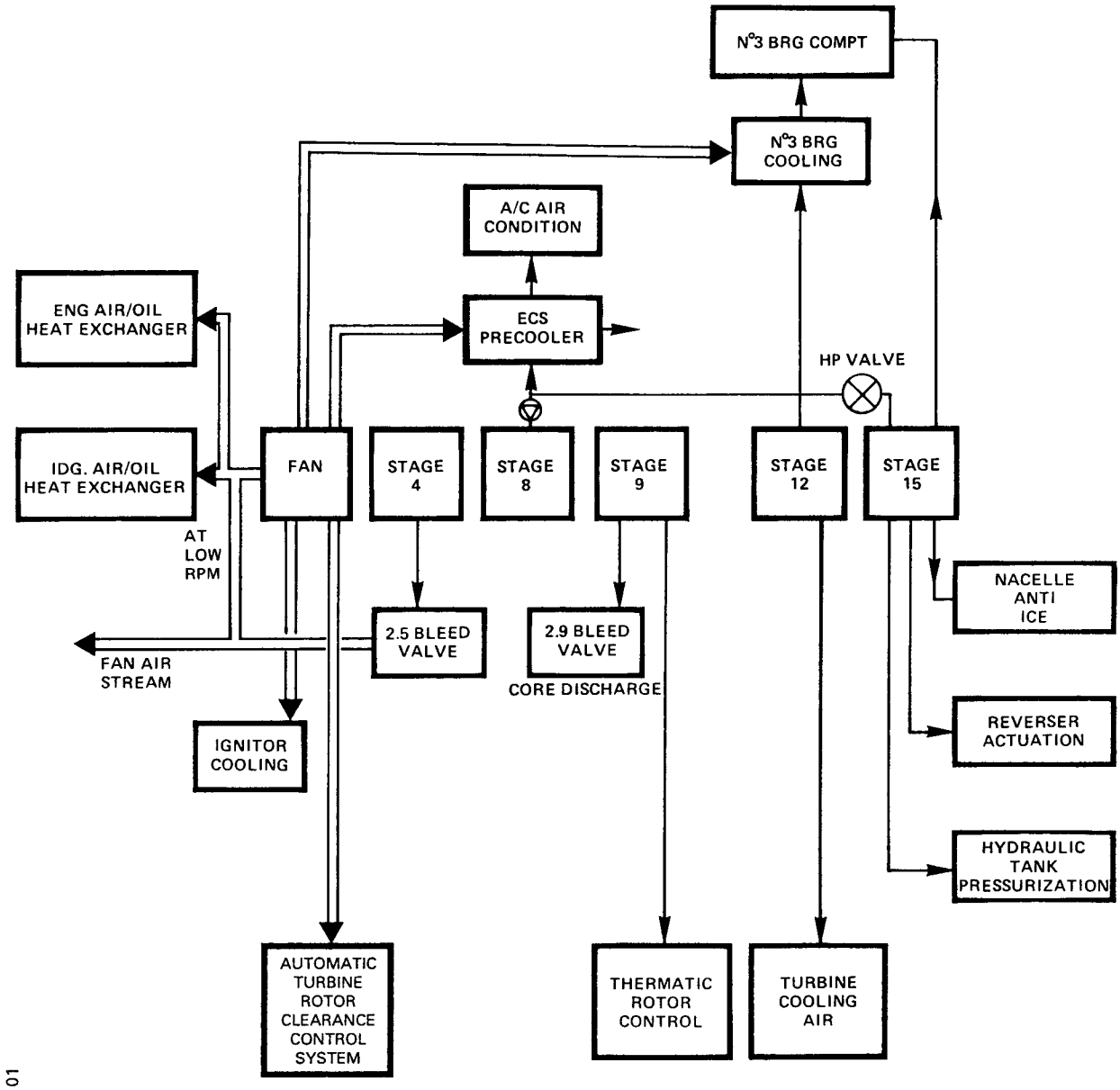
G. Indicating
Stator vane angle position, turbine case cooling position, engine AOHEV position, 2.5 bleed valve position, and indicating of ambient nacelle temperature (Ref. 75-41-00) are provided.

2. Operation
All engine air enters through the inlet cowl into the front mounted fan. After being compressed by the fan, the airflow is divided by the flow splitter in the fan frame into primary and secondary airflows.

A. Secondary Airflow
Secondary air is discharged through the fan exit nozzle during normal engine operation and provides the major portion of engine thrust. When the thrust reverser is deployed, the fan exit nozzle is blocked and the secondary air is directed outward in the forward direction and through the reverser cascades to provide reverse thrust. Some of the fan discharge air may come from the airflow through LP compressor discharge bleed valve located in the fan frame. A small portion of the secondary air is used for :
- ATRCCS and ignition system cooling
- air conditioning system precooler exchanger, IDG oil heat exchanger and engine AOHEV.

Secondary air is about 4/5 of the total airflow of the engine.

B. Primary Airflow
The primary airflow is that air which enters the engine near the fan rotor hub and is routed inward by the flow splitter. It passes through the low pressure compressor and into the engine core. The primary airflow is used to generate the high pressure gas that drives the high and low pressure turbines. The air conditioning system high pressure air, thrust reverser actuation system air and nacelle anti-ice air are bled from the HP compressor 8th and 15th stages.



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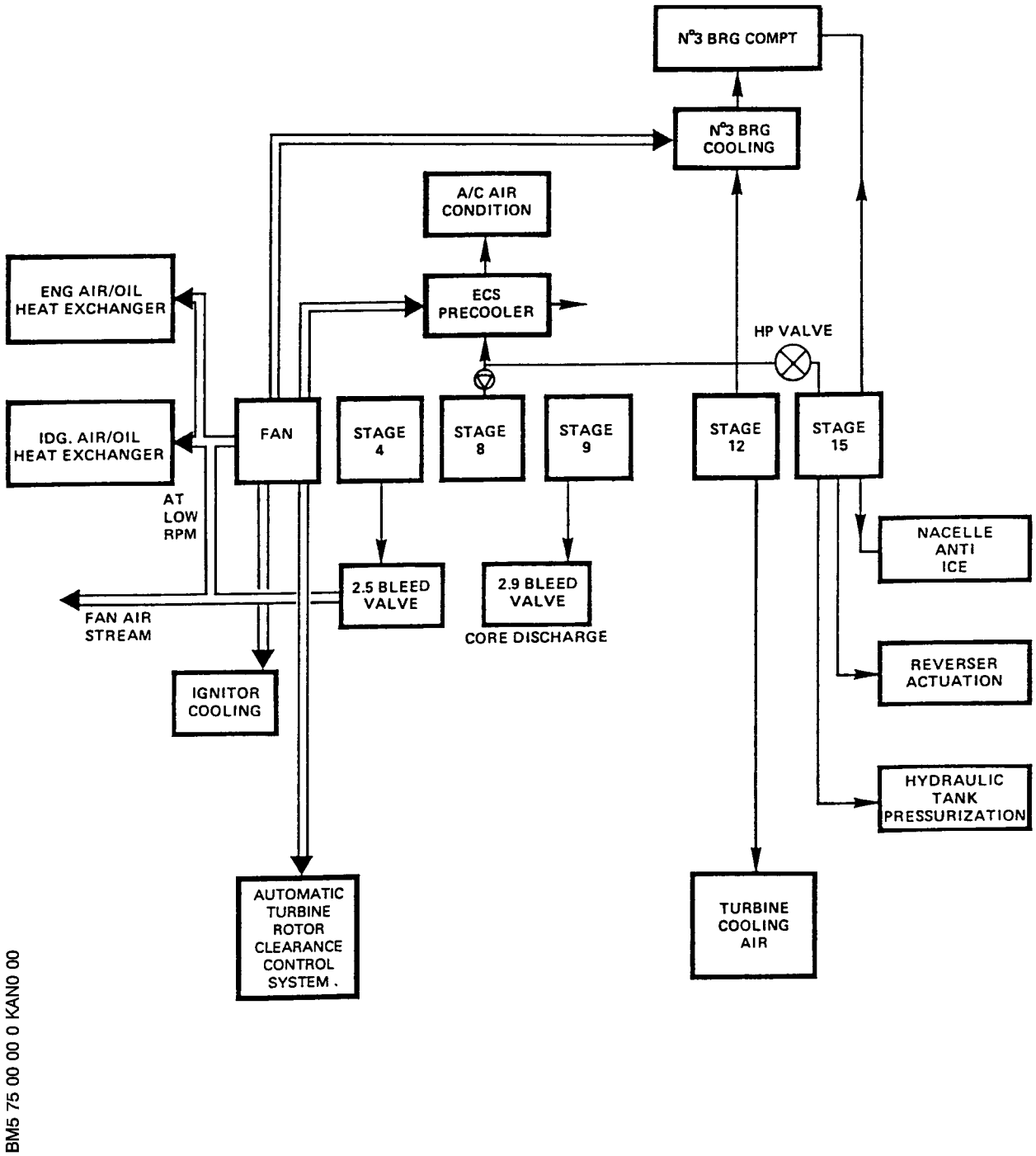
Air Bleed - Schematic (Phase I Configuration)
Figure 001



Air Bleed - Schematic (Phase III Configuration)
Figure 002

1. Fits and Clearance

A. General

(1)Reference numbers on figures indicate location of parts for which fits and clearances are specified.
Description of, and limits for, these fits and clearances are located in tables of corresponding reference numbers.

(2)Unless otherwise specified, all fits are diametral.

(3)Numbers in all columns shall be interpreted in inches, and (millimeters).

(4)Letter "T" following limits indicates tight fit.

(5)Description column provides nomenclature for part or parts concerned.

B. Inspection Frequency Requirements

(1)IFR column provides inspection frequency requirements.
Letter Codes A, B or C located in IFR column indicate manner and frequency of inspection recommended for item identified by adjacent reference number, as applicable to normal or routine repair. Definitions for these codes are as follows :

IFR CODE	DEFINITION
A	Clearance or fit must be calculated from part measurements at each installation of parts. Part measurements taken and recorded at time of individual part inspection are considered equally as valid as measurements taken at time of part installation.
B	Clearance or fit must be estimated at each installation of parts. Use trial assembly or similar means to estimate clearance or fit. Measurement of parts and calculation of actual fit or clearance is required only if : - Estimating procedure indicates that clearance or fit is outside specified tolerance, or - Either or both mating parts involved have been replaced or repaired in an area or way which would affect the clearance or fit.
C	Fit not subject to change in normal engine operation. Measurement of parts and calculation of fit is required only if either of mating parts involved has been replaced or repaired in an area or way which would affect fit.

C. New Part Reference Dimensions

(1)Dimensions are provided in this column for reference only.

(2)Dimensions are the Minimum and Maximum manufacturing values in inches (and millimeters) for each part listed in the description column.

D. Limits

(1)Limits applicable to any combination of new or used parts.

(a)This column provides the acceptable (minimum - maximum) range of fit or clearance in inches (and millimeters). These limits may be applied to any combination of new or used parts.

(b)The limits are based on the mathematical combination of the minimum and maximum values specified in the new part reference dimension column. See Example 1.

(c)Limits which have been expanded to be less restrictive than new part conditions are identified with an asterisk (*) adjacent to the value. See Example 2.

EXAMPLE 1

REF. No.	IF R	Description	New Part Reference Dimensions Min	-	Max	Limits Min	-	Max
1812		Bearing	0.508 (12.903)		0.512 (13.005)			
		Support	0.517 (13.131)		0.527 (13.385)	0.005 (0.126)		0.019 (0.482)

NOTE : In Example 1 limits are determined by comparing bearing and support referenced dimensions as follows :

0.517 (13.131)	(-)	0.512 (13.005)	=	.005 (0.126)
.527 (13.385)	(-)	.508 (12.903)	=	.019 (0.482)

EXAMPLE 2

REF. No.	IF R	Description	New Part Reference Dimensions Min	-	Max	Limits Min	-	Max
1812		Bearing	0.508 (12.903)		0.512 (13.005)			
		Support	0.517 (13.131)		0.527 (13.385)	0.005 (0.126)		0.020 * (0.508)*

NOTE : In Example 2 limits represent less restrictive values as indicated by the asterisk (*).

(2)Limits for selective application to engines scheduled for partial refurbishment.

(a)A second set of limits enclosed by brackets and lines may be provided. See Example 3. These enclosed limits are less restrictive and are intended to be selectively applied to engines scheduled for partial refurbishment.

EXAMPLE 3

REF. No.	IFR	Description	New Part Reference Dimensions Min	-	Max	Limits Min	-	Max
1812		Bearing	0.508 (12.903)		0.512 (13.005)			
		Support	0.517 (13.131)		0.527 (13.385)	0.005 (0.126)		0.019 (0.482)
						.005 (0.13)		.022 (0.56)

NOTE : In Example 3 the enclosed (less restrictive) limits are intended for selective application, see text.

E. Fits and Clearances

REF. No.	IFR		New Part Reference Dimensions Min	-	Max	Limits Min	-	Max
492	B	Self-Retaining Pin (Bleed Valve Linkage) Bleed Valve Connecting Link Bearing (Ref. Fig. 601)						
		Pin ---------	.248 (6.300)		.249 (6.324)			
		Bearing -----	.2495 (6.3373)		.2500 (6.3500)	.0005 (0.013)		.002 (0.050)
493	B	Side Clearance, Bleed Valve Connecting Link Bearing						
		Bleed Valve Linkage Rod Assembly (Ref. Fig. 601)						
		Bearing -----	.338 (8.586)		.343 (8.712)			
		Rod ---------	.344		.346	.001		.008

			(8.738)	(8.788)	(0.025)	(0.203)
505	B	Bleed Valve Connecting Link Pin Self-Retaining Pin (Bleed Valve Linkage) Bleed Valve Linkage Rod Assembly (Ref. Fig. 601)				
		Pin ---------	.248 (6.300)	.249 (6.324)		
		Link --------	.2495 (6.338)	.2505 (6.362)	.0005 (0.013)	.0025 (0.063)
582	C	Bolt Stage 6 Rod End Bearing (Ref. Fig. 603), (Sheet 5/10)				
		Bolt --------	.3109 (7.897)	.3119 (7.922)		
		Bearing -----	.3120 (7.9248)	.3125 (7.9375)	.0001 (0.003)	.0016 (0.040)
583	C	Bolt Stage 6 Synchronizing Ring Assembly (Ref. Fig. 603), (Sheet 5/10)				
		Bolt --------	.3109 (7.897)	.3119 (7.922)		
		Ring --------	.3120 (7.9248)	.3125 (7.9375)	.0001 (0.003)	.0016 (0.040)
584	C	Bolt Inlet HPC Lever (Ref. Fig. 603), (Sheet 2/10)				
		Bolt --------	.3380 (8.5852)	.3382 (8.5902)		
		Lever -------	.3374 (8.5700)	.3380 (8.5852)	.0008T (0.0203T)	.0000 (0.0000)
585	C	Bolt HPC Lever Set (Ref. Fig. 603), (Sheet 2/10)				
		Bolt --------	.3380 (8.5852)	.3382 (8.5902)		
		Lever -------	.3374 (8.5700)	.3380 (8.5852)	.0008T (0.0203T)	.0000 (0.0000)
586	C	HPC Lever Set Inlet HPC Lever				

		(Ref. Fig. 603), (Sheet 2/10)				
		Lever Set ---	1.7722 (45.0139)	1.7727 (45.0265)		
		Inlet Lever -	1.7727 (45.027)	1.7752 (45.090)	.000 (0.000)	.003 (0.076)
587	C	Inlet HPC Lever Bearing (Ref. Fig. 603), (Sheet 2/10)				
		Lever Set ---	1.7722 (45.0139)	1.7727 (45.0265)		
		Bearing -----	1.7712 (44.9885)	1.7717 (45.0011)	.0015T (0.038T)	.0005T (0.013T)
588	B	Bearing Compressor Stator Lever Support (Ref. Fig. 603), (Sheet 2/10)				
		Bearing -----	2.6757 (67.963)	2.6772 (68.000)		
		Support -----	2.6774 (68.0060)	2.6779 (68.0186)	.0002 (0.006)	.0022 (0.055)
589	C	Bolt HPC Synchronizing Ring Clevis Assembly (Ref. Fig. 603), (Sheet 5/10)				
		Bolt --------	.4345 (11.037)	.4355 (11.061)		
		Ring --------	.437 (11.100)	.438 (11.125)	.0015 (0.039)	.0035 (0.088)
592	C	Bolt Cylinder Stop (Ref. Fig. 603), (Sheet 8/10)				
		Bolt --------	.216 (5.487)	.217 (5.511)		
		Stop --------	.218 (5.538)	.220 (5.588)	.001 (0.026)	.004 (0.101)
593	B	Bearing Compressor Stator Cylinder Support (Ref. Fig. 603), (Sheet 8/10)				
		Bearing -----	1.4365 (36.488)	1.4375 (36.512)		
		Support -----	1.438 (36.526)	1.439 (36.550)	.0005 (0.013)	.0025 (0.063)

599	C	Compressor Cylinder Bearing (Ref. Fig. 603), (Sheet 8/10)				
		Cylinder ----	.7487 (19.0170)	.7490 (19.0246)		
		Bearing -----	.7495 (19.0373)	.7500 (19.0500)	.0005 (0.0127)	.0013 (0.0330)
600	C	Bolt HPC Lever Set (Ref. Fig. 603), (Sheet 9/10)				
		Bolt --------	.497 (12.624)	.498 (12.649)		
		Lever -------	.4995 (12.688)	.5005 (12.712)	.0015 (0.039)	.0035 (0.088)
601	C	Bolt HPC Lever Set (Ref. Fig. 603), (Sheet 9/10)				
		Bolt --------	.3739 (9.4971)	.3744 (9.5097)		
		Lever -------	.3745 (9.513)	.3755 (9.537)	.0001 (0.003)	.0016 (0.040)
602	C	Bolt Rod End Bearing Assembly (Ref. Fig. 603), (Sheet 9/10)				
		Bolt --------	.3739 (9.4971)	.3744 (9.5097)		
		Bearing -----	.3745 (9.5123)	.3750 (9.5250)	.0001 (0.103)	.0011 (0.027)
603	C	Bearing Rod End (Ref. Fig. 603), (Sheet 9/10)				
		Bearing -----	.8120 (20.6248)	.8125 (20.6375)		
		Rod ---------	.8123 (20.6325)	.8128 (20.6451)	.0002T (0.0051T)	.0008 (0.0203)
604	C	Bolt HPC Synchronizing Ring Clevis Assembly (Ref. Fig. 603), (Sheets 4/10 and 10/10)				
		Bolt --------	.4345	.4355		

			(11.037)	(11.061)		
		Ring --------	.437	.438	.0015	.0035
			(11.100)	(11.125)	(0.039)	(0.088)
605	C	Bolt HPC Synchronizing Ring Clevis Assembly (Ref. Fig. 603), (Sheets 4/10 and 10/10)				
		Bolt --------	.3109	.3119		
			(7.897)	(7.922)		
		Ring --------	.3120	.3125	.0001	.0016
			(7.9248)	(7.9375)	(0.003)	(0.040)
606	C	Bolt Stage 5 and 7 Rod End Bearing (Ref. Fig. 603), (Sheets 4/10 and 10/10)				
		Bolt --------	.3109	.3119		
			(7.897)	(7.922)		
		Bearing -----	.3120	.3125	.0001	.0016
			(7.9248)	(7.9375)	(0.003)	(0.040)
607	A	Radial Clearance (Ref. Fig. 603), (Sheets 3/10, 4/10, 5/10 and 10/10)				
		Rod End Spherical Bearing		-------	.000	
609	C	Bolt HPC Clevis (Ref. Fig. 603), (Sheet 4/10)				
		Bolt --------	.4345	.4355		
			(11.037)	(11.061)		
		Clevis ------	.437	.438	.0015	.0035
			(11.100)	(11.125)	(0.039)	(0.088)
610	C	Bolt Rod End Bearing (Ref. Fig. 603), (Sheet 4/10)				
		Bolt --------	.3109	.3119		
			(7.897)	(7.922)		
		Bearing -----	.3120	.3125	.0001	.0016
			(7.9248)	(7.9375)	(0.003)	(0.040)
611	C	Bolt HPC Clevis (Ref. Fig. 603), (Sheet 4/10)				
		Bolt --------	.3109	.3119		

			(7.897)	(7.922)		
		Clevis ------	.3120	.3125	.0001	.0016
			(7.9248)	(7.9375)	(0.003)	(0.040)
612	C	Bolt				
		HPC Synchronizing Ring Clevis Assembly				
		(Ref. Fig. 603), (Sheet 3/10)				
		Bolt --------	.4345	.4355		
			(11.037)	(11.061)		
		Ring --------	.437	.438	.0015	.0035
			(11.100)	(11.125)	(0.039)	(0.088)
613	C	Bolt				
		Rod End Bearing				
		(Ref. Fig. 603), (Sheet 3/10)				
		Bolt --------	.3109	.3119		
			(7.897)	(7.922)		
		Bearing -----	.3120	.3125	.0001	.0016
			(7.9248)	(7.9375)	(0.003)	(0.040)
614	C	Bolt				
		HPC Synchronizing Ring Clevis Assembly				
		(Ref. Fig. 603), (Sheet 3/10)				
		Bolt --------	.3109	.3119		
			(7.897)	(7.922)		
		Ring --------	.3120	.3125	.0001	.0016
			(7.9248)	(7.9375)	(0.003)	(0.040)
837	B	Support Link Shoulder Bolts				
		No. 3 Bearing Air Cooler Assembly				
		Support Brackets				
		(Ref. Fig. 602)				
		Bolt --------	.2494	.2499		
			(6.3348)	(6.3474)		
		Bracket -----	.2500	.2510	.0001	.0016
			(6.350)	(6.375)	(0.003)	(0.040)
838	B	Support Link Shoulder Bolts				
		Support Link Rod End Bearings				
		(Ref. Fig. 602)				
		Bolt --------	.2494	.2499		
			(6.3348)	(6.3474)		
		Bearing -----	.2495	.2500	.0006	.004T
			(6.3373)	(6.3500)	(0.0152)	(0.0102T)
839	B	Side Clearance,				

Support Link Rod End Bearings					
No. 3 Bearing Air Cooler Assembly Support Brackets (Ref. Fig. 602)					
Bearing -----	.432 (10.973)	.437 (11.099)			
Bracket -----	.4375 (11.113)	.4395 (11.163)	.0005 (0.013)	.0075 (0.190)	

F. Special Assembly Procedure

REF. No.	IF R	Designation
618	A	Compressor Stator Lever - Set Bracket - Shim Fitting (Ref. Fig. 603), (Sheet 7/10) (Ref. 75-31-01, P. Block 401)
750	A	Bleed Valve Rigging Procedure (Ref. Fig. 601) (Ref. 75-32-01, P. Block 501)
760	A	Turbine Vane and Blade Cooling Air Valve Position Switch - Installation (Ref. Fig. 605) (Ref. 75-24-13, P. Block 401)
1004	A	Procedure for Assembling the No. 3 Bearing Air Cooler Assembly Midspan Support (Ref. Fig. 602) (Ref. 75-22-01, P. Block 401)
2010		Turbine Case Cooling (TCC) Actuation System Assembly and Rigging Procedure (Ref. Fig. 604) (Ref. 75-24-01, P. Block 501) (Ref. 75-24-01, P. Block 401)

G. Special Torques

REF. No.	IF R	Designation
730	A	Nut, Variable Stator Clevis Retaining (Ref. Fig. 603), (Sheets 3/10, 4/10, 5/10 and 10/10)

		(Ref. 75-XX-XX, P. Block 401)
731	A	Nut, Bellcrank Spacer Clevis Retaining (Ref. Fig. 603), (Sheet 3/10) (Ref. 75-XX-XX, P. Block 401)
732	A	Nut, Bellcrank Spacer Clevis Retaining (Ref. Fig. 603), (Sheets 5/10 and 10/10) (Ref. 75-XX-XX, P. Block 401)
733	A	Nut, Actuating Cylinder Retaining (Ref. Fig. 603), (Sheet 9/10) (Ref. 75-XX-XX, P. Block 401)
734	A	Bolt, Stage 7HPC Lever (Ref. Fig. 603), (Sheet 10/10) (Ref. 75-XX-XX, P. Block 401)
735	A	Compressor Stator Actuator Rod End Bearing Retaining Nut (Ref. Fig. 603), (Sheet 6/10) (Ref. 75-XX-XX, P. Block 401)
2151		Hose/Tube Clamp Screws (Ref. 75-24-07, P. Block 401) (Ref. 75-24-09, P. Block 401)

2. Engine Air System External Part Examination

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Access Platform
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

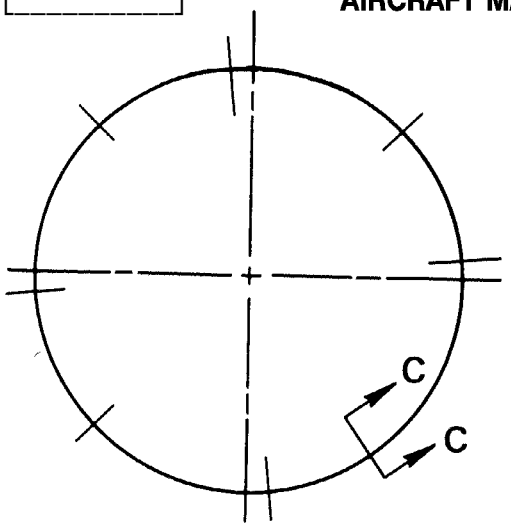
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Install access platform.

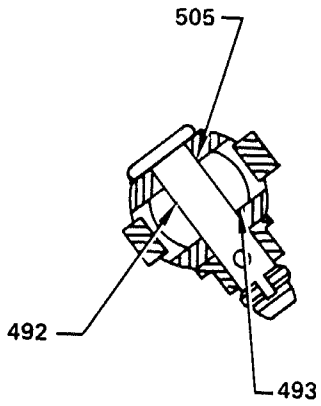
C. Procedure

(1)Visually examine the engine air system external tubes for damage (See Table 601).

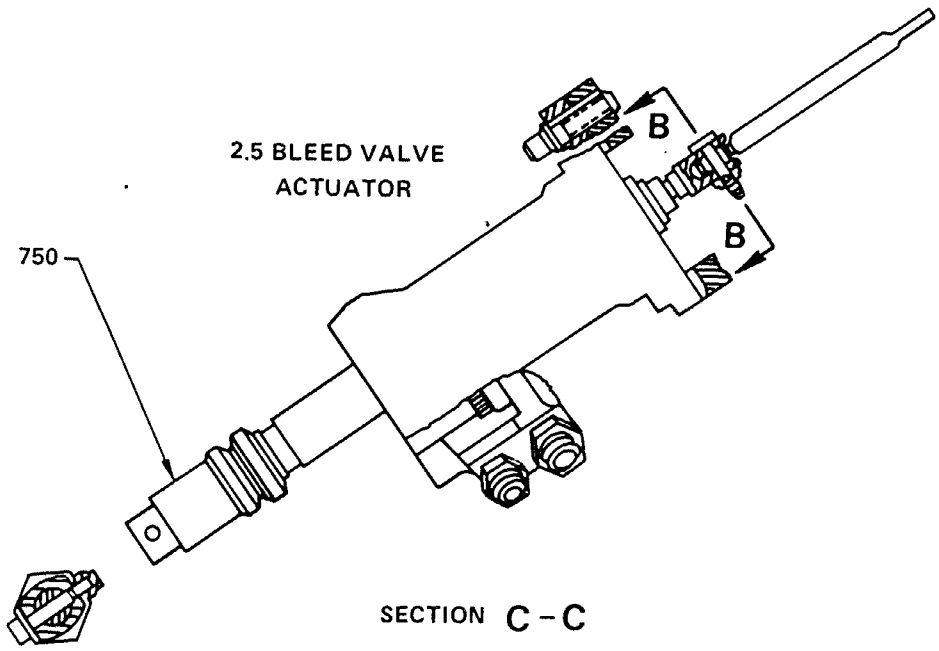
NOTE : This inspection procedure does not require tube removal in order to inspect and verify acceptable tube condition. Air system tube



SCHEMATIC FRONT VIEW



SECTION B-B

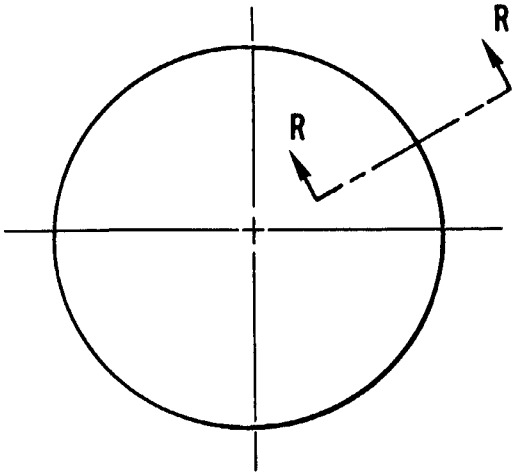


SECTION C-C

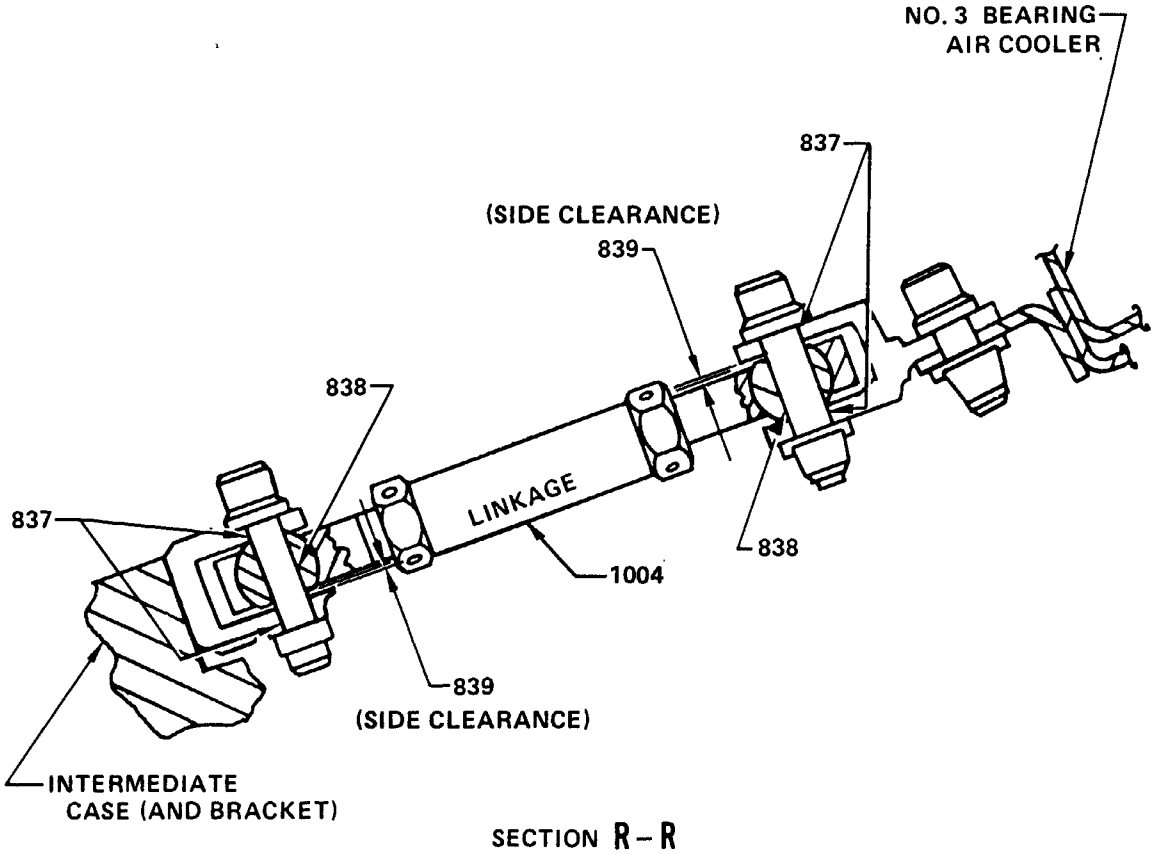
L-A3295

BM5 75 00 00 6 KAMO - 25 - 20
DM5

Fan Exit Case
Figure 601



SCHEMATIC REAR VIEW
INTERMEDIATE GROUP

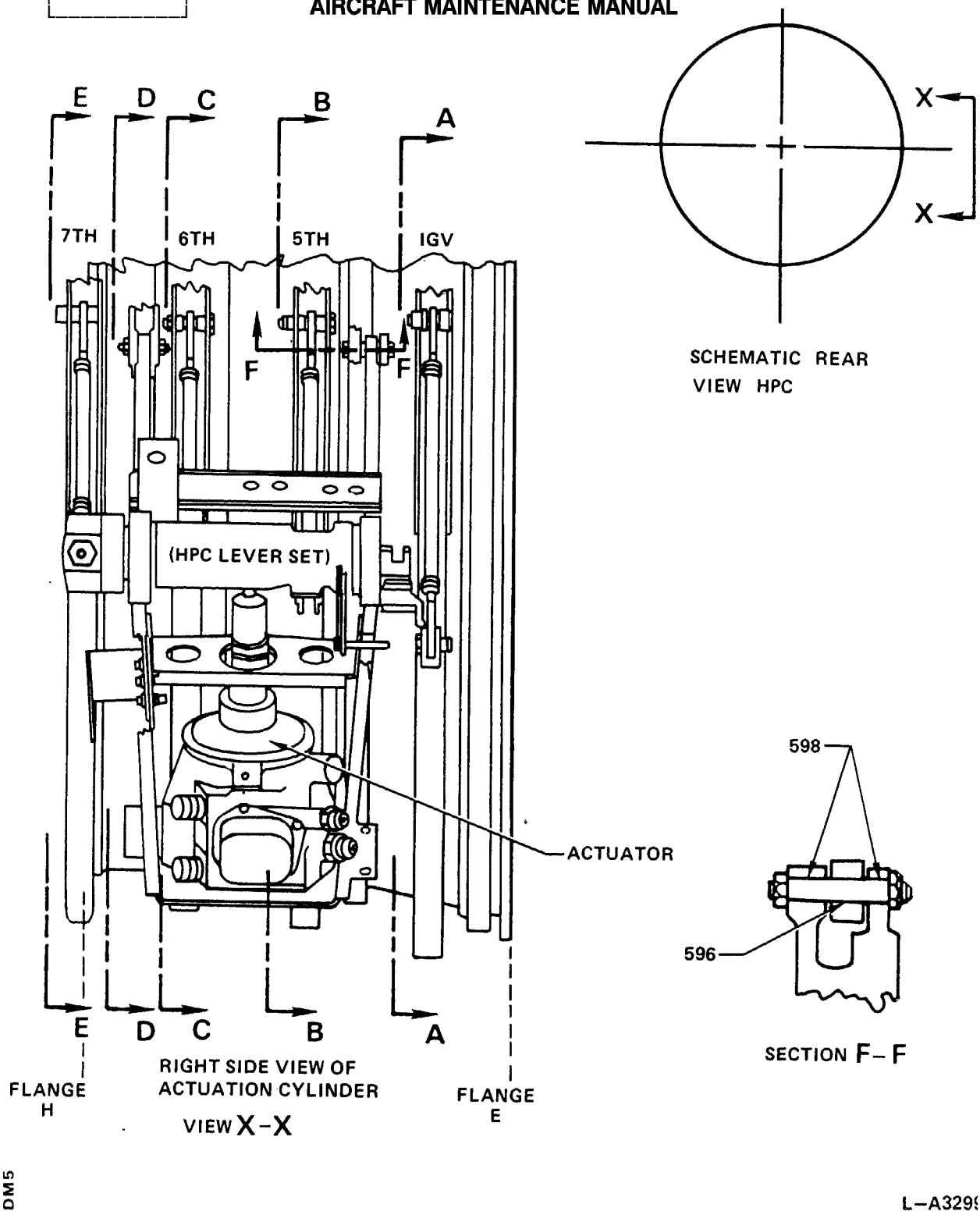


SECTION R-R
(NO. 3 BEARING AIR COOLER LINKAGE/ BRACKETS)

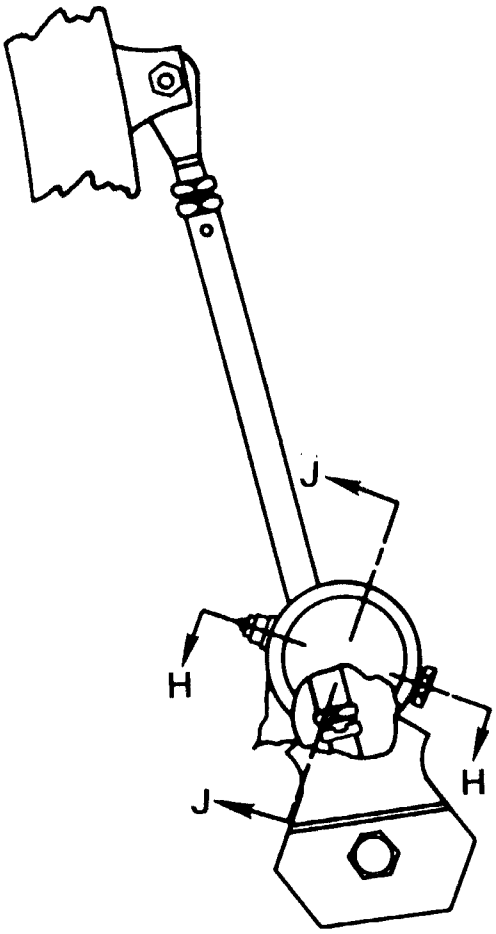
L-A3296
0989

BM5 75 00 00 6 KCMO-01

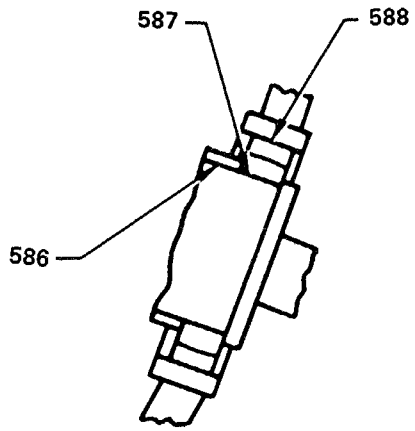
Intermediate Case
Figure 602



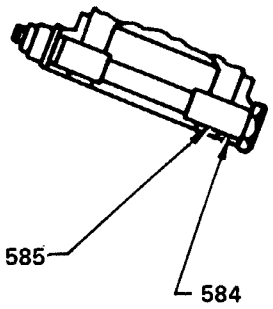
HPC Stator Vane Actuator and Lever Assembly - Sheet 1/10
Figure 603



SECTION A-A
(IGV)



SECTION J-J

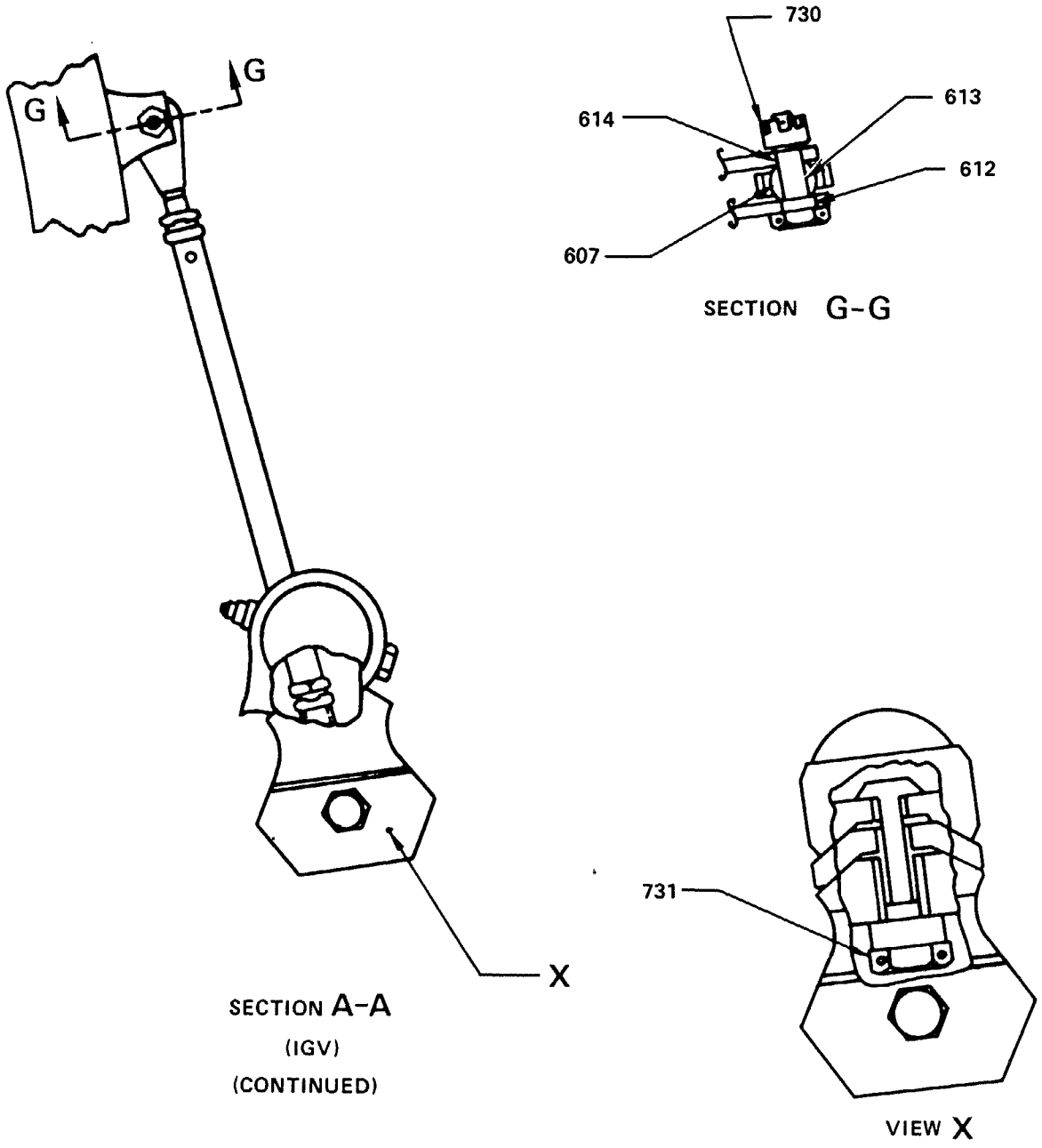


SECTION H-H

L-A330

BM5 75 00 00 6 KEMB · 25 · 20
DM5

HPC Stator Vane Actuator and Lever Assembly - Sheet 2/10
Figure 603



SECTION G-G

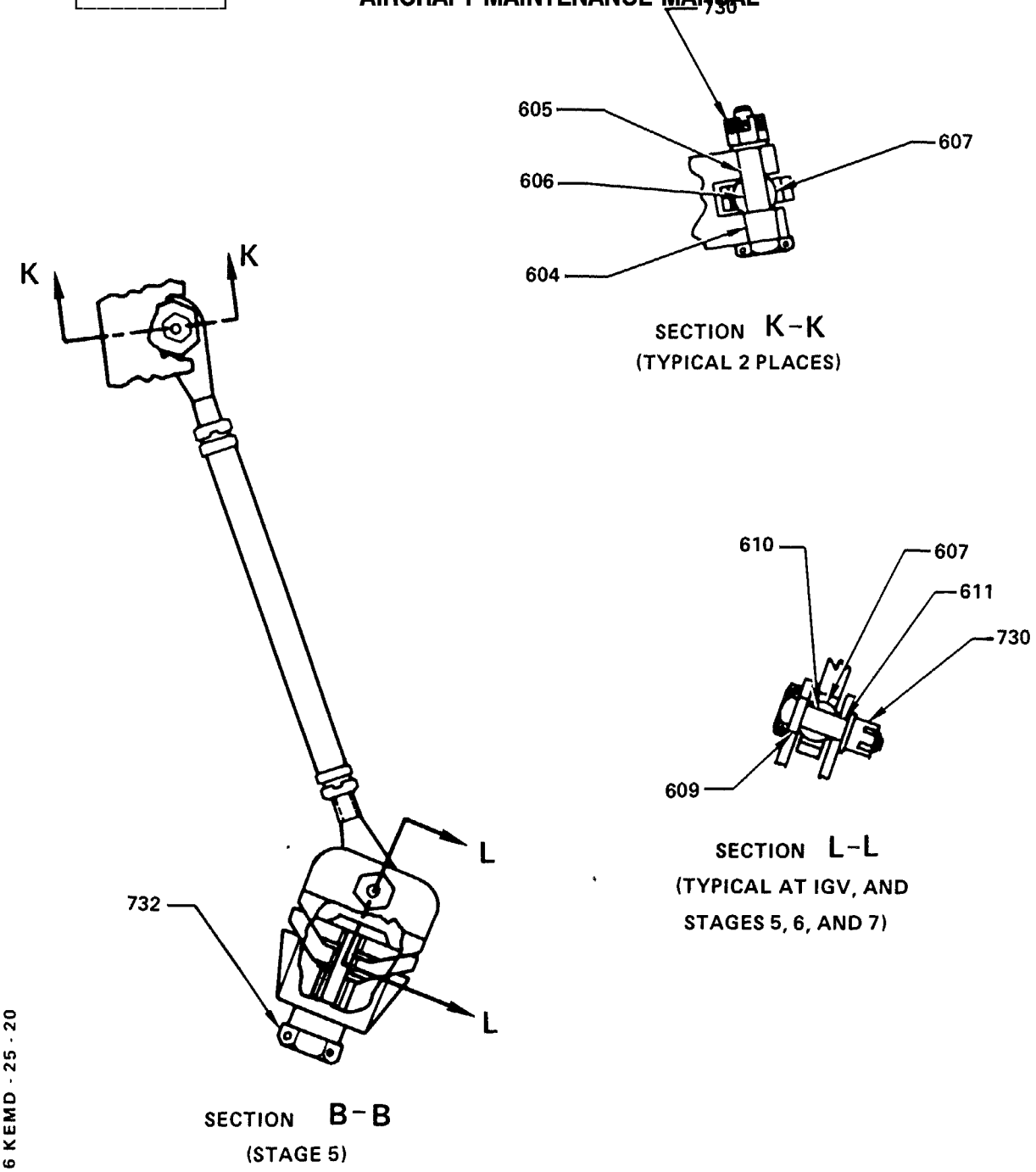
SECTION A-A
(IGV)
(CONTINUED)

VIEW X

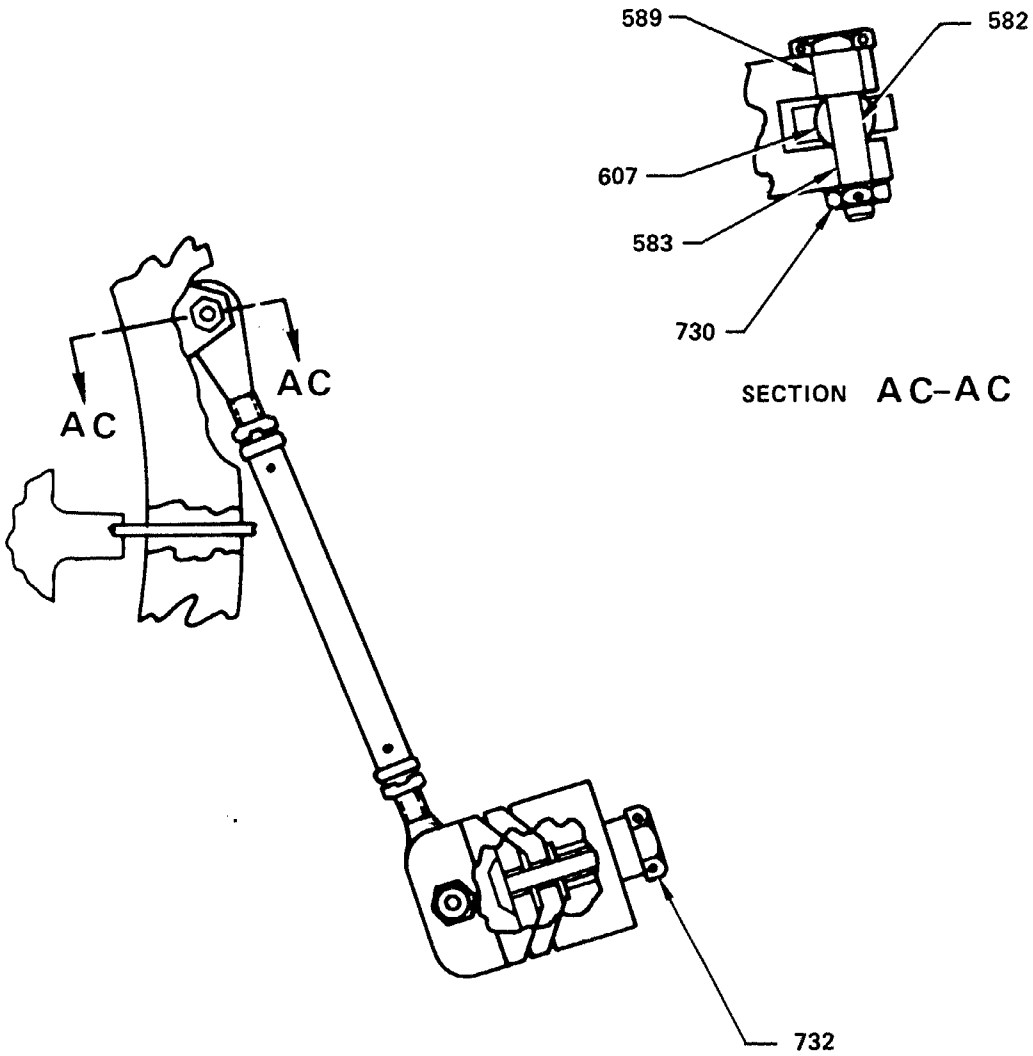
BM5 75 00 00 6 KEMC - 25 - 20
DM5

L-A3301

HPC Stator Vane Actuator and Lever Assembly - Sheet 3/10
Figure 603



HPC Stator Vane Actuator and Lever Assembly - Sheet 4/10
Figure 603



SECTION AC-AC

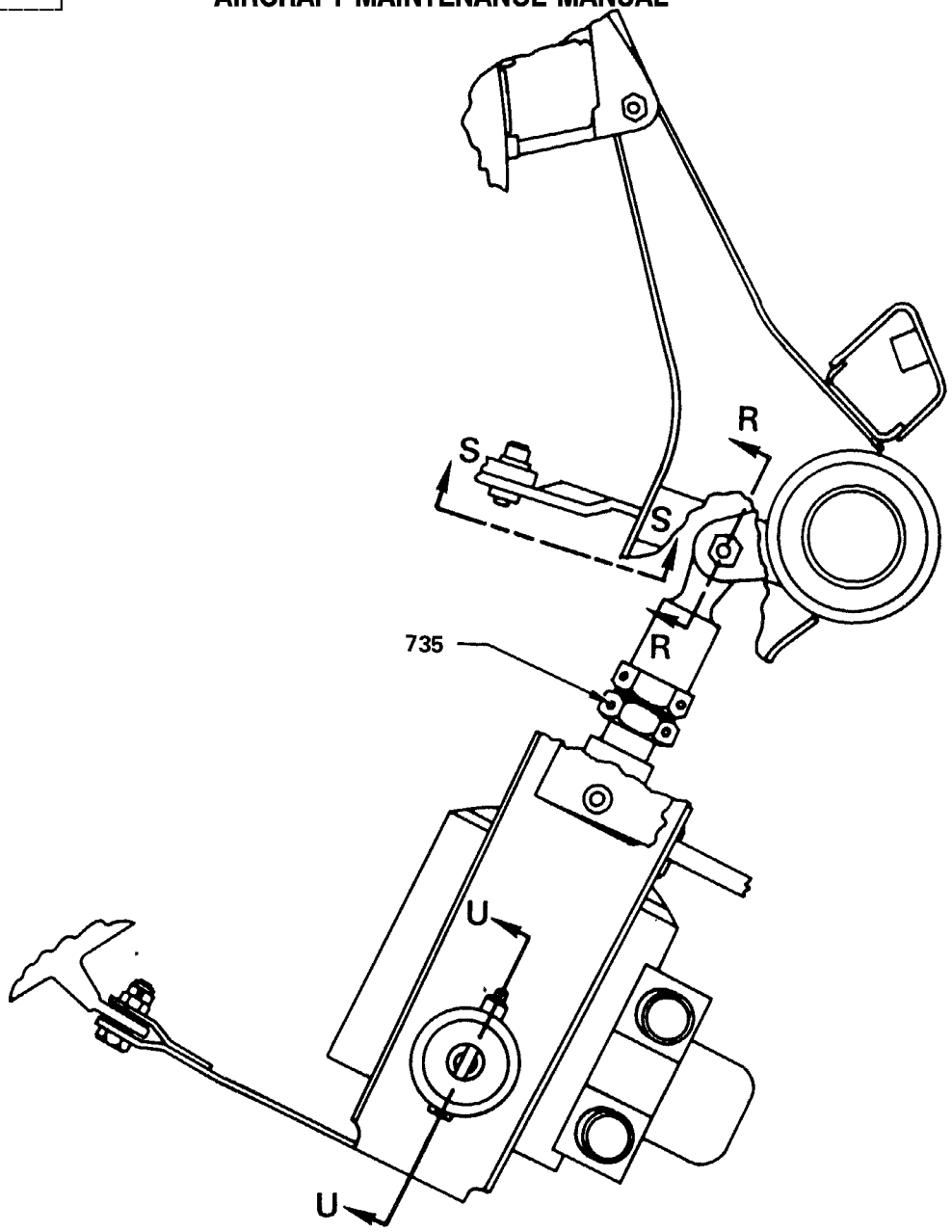
SECTION C-C

(STAGE 6)

BM5 75 00 00 6 KEME - 25 - 20
DM5

L-A3310

HPC Stator Vane Actuator and Lever Assembly - Sheet 5/10
Figure 603



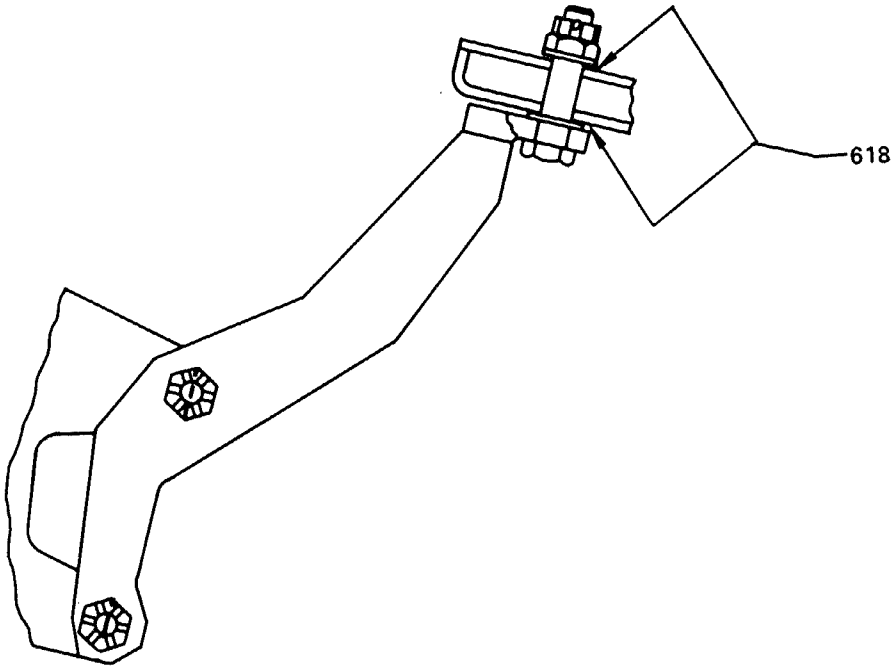
SECTION D–D

(COMPRESSOR STATOR LEVER SET AND ACTUATOR)

L–A3305

BM5 75 00 00 6 KEMF - 25 - 20
DM5

HPC Stator Vane Actuator and Lever Assembly - Sheet 6/10
Figure 603

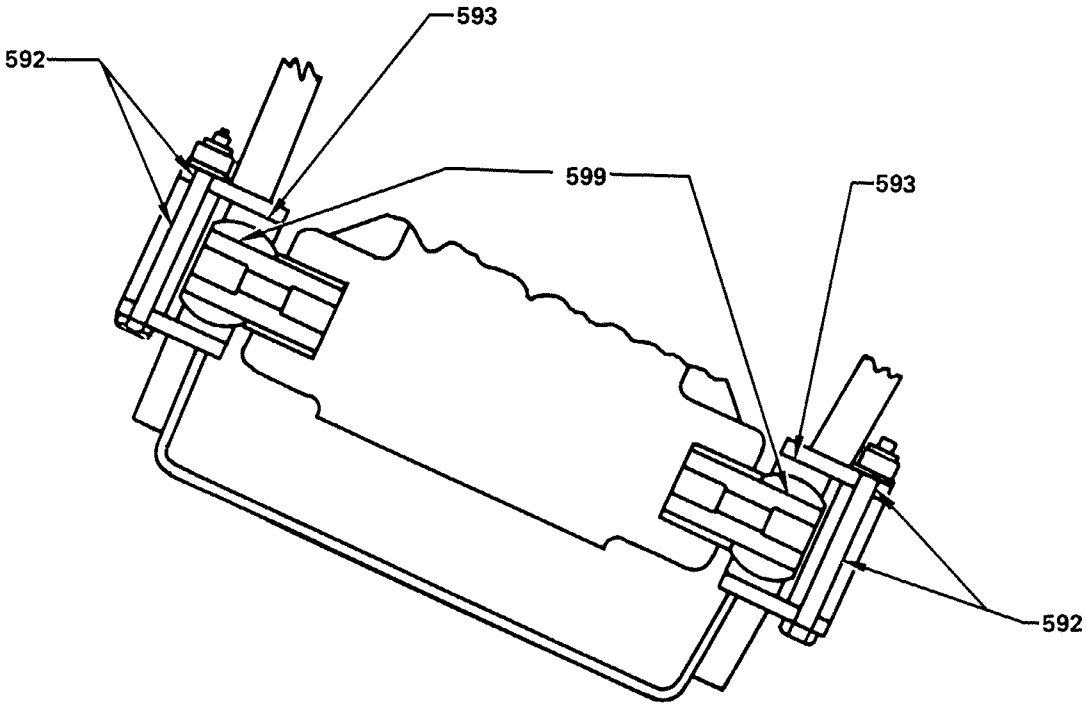


SECTION S-S

BM5 75 00 00 6 KEMG - 25 - 20
DM5

L-A330

HPC Stator Vane Actuator and Lever Assembly - Sheet 7/10
Figure 603

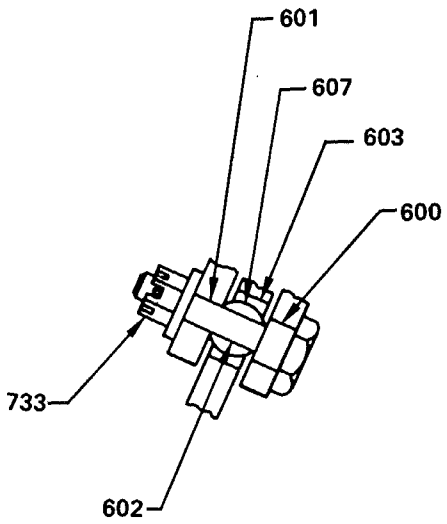


SECTION U-U

BM5 75 00 00 6 KEMH - 25 - 20
DM5

L-A3308

HPC Stator Vane Actuator and Lever Assembly - Sheet 8/10
Figure 603

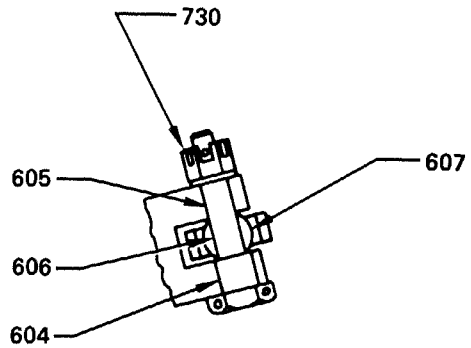


SECTION R-R

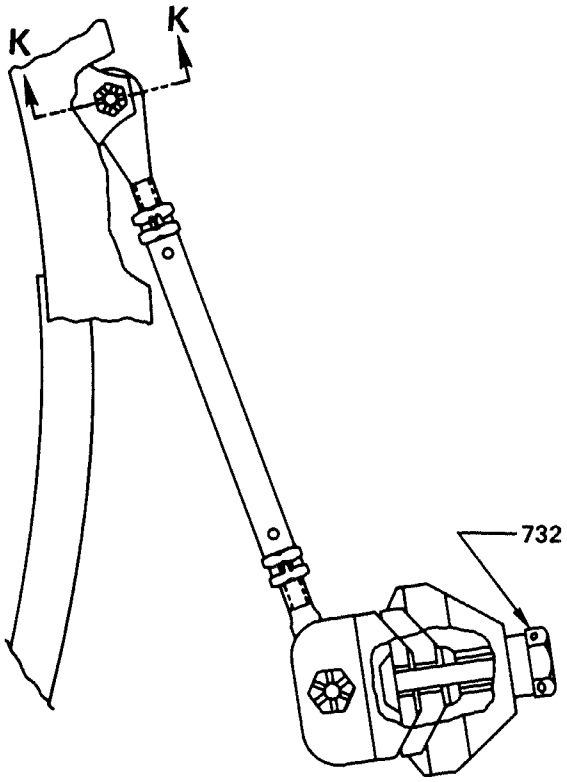
BM5 75 00 00 6 KEMJ - 25 - 20
DM5

L-A3307

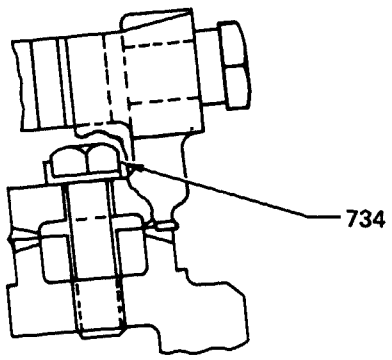
HPC Stator Vane Actuator and Lever Assembly - Sheet 9/10
Figure 603



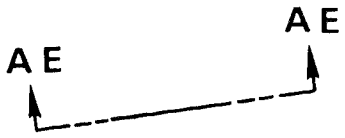
SECTION K-K
(TYPICAL 2 PLACES)



SECTION E-E
(STAGE 7)



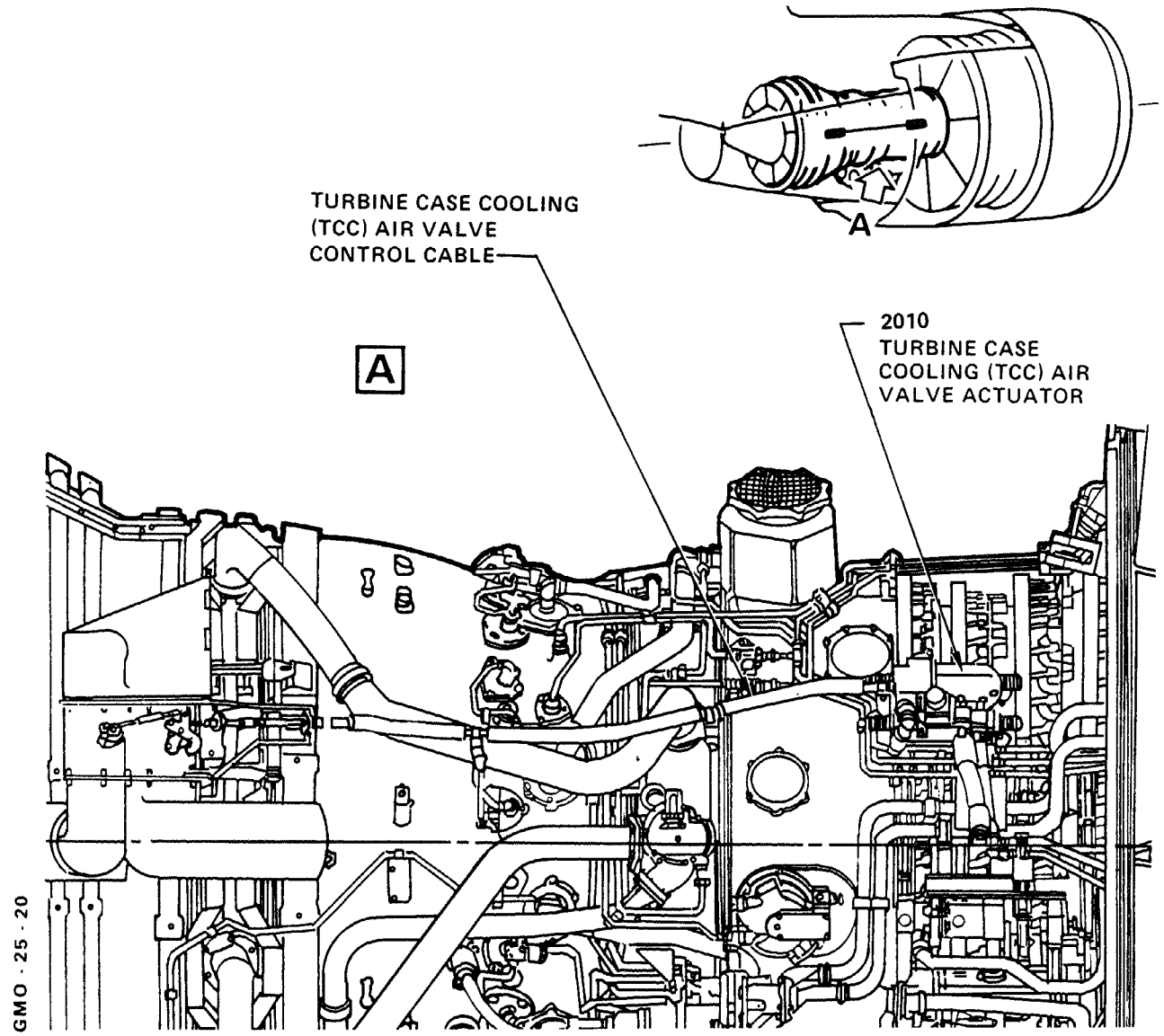
VIEW AE-AE
(STAGE 7)



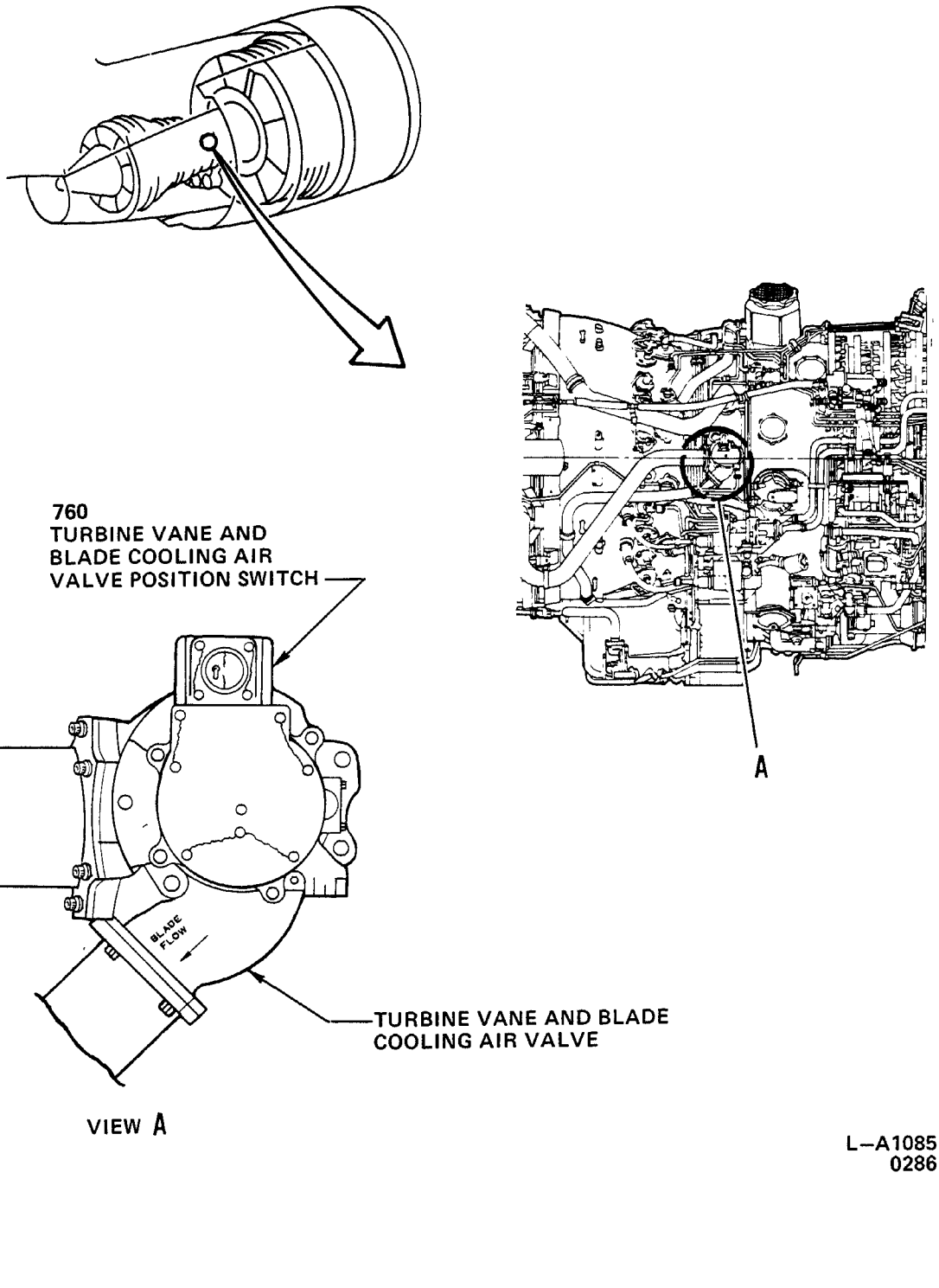
BM5 75 00 00 6 KEMK - 25 - 20
DM5

L-A3306

HPC Stator Vane Actuator and Lever Assembly - Sheet 10/10
Figure 603



Turbine Case Cooling (TCC) Air Valve Actuator and Cable
Figure 604



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Turbine Vane and Blade Cooling Air Valve Position Switch
Figure 605

dents are to be considered acceptable for continued service if, visually, the tube OD is seen to not be decreased by more than 20% at any particular location.

The following Inspection Reference Table 601 is intended to serve as an aid for identifying certain areas and conditions whenever maintenance time permits inspection. Tube inspection should not be accomplished solely on the basis of this table. Table 601 does not imply that items or conditions listed are all-inclusive. Experience and judgement will continue to be an important part of any inspection program.

ITEM	INSPECT FOR	CONTINUE IN SERVICE LIMITS
Air System Tubes	Cracks	Up to 180 degrees circumferencially or 6.0 in. (152.400 mm) axially if the crack is stop drilled and does not permit air to blow on the case or flange. Up to 2 cracks per tube or collector. If tubes are found cracked, the TCC system tubes must be inspected for loose and worn clamps. Loose clamps must be tightened and worn clamps must be replaced before the next flight. Cracked tubes must be replaced at the next A-check.
	Holes	Up to 0.150 in. (3.810 mm) diameter permitted if the air exiting the hole does not blow directly on the turbine case or flange. Up to 4 holes in all tubes connected to the collector. Up to 4 holes for each tube or collector are permitted if the total area is not more than 0.071 sq.in. (46.0 mm2). Tubes with holes that are more than 0.150 in. (3.810 mm) must be replaced at the next A-check.
	Corrosion and Stains	Permitted without restriction.

ITEM	INSPECT FOR	CONTINUE IN SERVICE LIMITS
	Loose Tube Nuts	None Permitted
	Loose or Broken Lockwire	None Permitted
	Nicks, Scratches, Chafing and Pitting	Nicks, scratches, chafing and pitting is permitted with no limit until air leakage occurs. If there is air leakage, treat it as a hole.
	Dents (without sharp edges or corners)	Permitted if the tubing OD is not decreased by more than 20 % at each location. No dents permitted within 0.25 in. (6.35 mm) or less from the tube ferrule.
	Dents (with sharp edges or corners)	Dents with or without sharp edges or corners are permitted with no limit as long as the tubing OD is decreased by more than 20 percent at each location. Tubes dented more than 20 percent must be replaced at the next A-check.

Inspection Reference Table.
Continue in Service Limits For the External Air System Tubes
Table 601

(2)Visually examine the external air system tubes for 0.125 in. (3.175 mm) minimum clearance to adjacent tubes or structure.
  (a)Minimum clearance between any two adjacent tubes or between one single tube and any other adjacent engine part shall be 0.125 in. (3.175 mm) unless otherwise specified. Exceptions to this clearance requirement are permitted at specific locations where adjacent tubes are clipped together or where other local constraints will prevent tube contact at clearances below 0.125 in. (3.175 mm) minimum.
  (b)Minimum clearance refers only to clearance relative to tube and not to fittings or other attached hardware.
(3)Examine the tubes to make sure they are correctly attached at all support locations.
  (a)Replace all worn clamps.
  (b)Tighten all loose clamp bolts and brackets at all support points

along the tube length.
(c)Tighten all loose tube fittings.
(4)Examine the air system tube connections, tube or manifold to component connections, and tube to case boss connections for leaks and loose connections.
(a)No leaks or loose connections permitted.
(b)Make all corrections as necessary.

D. Close-Up
(1)Remove access platform.
(2)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)If applicable, test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

ACCESSORY COOLING - DESCRIPTION AND OPERATION

1. General

Nacelle compartments and nacelle components are cooled either by natural convection from the compartment ventilation system or by specific cooling systems.
Fan compartment ventilation is made from fan flow airstream leaks.
Nacelle core compartment ventilation is obtained from the following air sources :

A. Primary and Secondary Engine Airflow Leaks.

B. Specific Accessory Cooling Air Discharge :
- engine air/oil heat exchanger
- IDG air/oil heat exchanger
- 2.5 bleed discharge through the IDG air/oil heat exchanger at low RPM.
- Component dedicated cooling (fan air) :
  . HP valve
  . Ignition system
  . Starter valve
  . Oil quantity transmitter
  . Door opening system actuator
  . PMA
  . TRC valve
  . Automatic turbine rotor clearance control (ATRCCS) (fan air).

D. In flight, cooling is ensured by ram air and fan discharge air and by a nacelle core compartment cooling system at an altitude below 25,000 feet. with engine shut down the cooling and ventilation are performed by convection.

GENERATOR AIR/OIL COOLING - DESCRIPTION AND OPERATION

1. General

The IDG oil system is a closed oil system using two fluid cooling : (Ref. 24-11-00)
- fuel engine
- fan air.

When the engine is at idle, air discharged from 2.5 compressor bleed is used to increase IDG oil cooling.

2. Description

A. IDG Air/Oil Heat Exchanger and its Control (Ref. Fig. 001, 002)

An air/oil heat exchanger is provided for the IDG oil supply. The heat exchanger receives engine fan exit air via an ON/OFF airflow control valve. The primary control for this valve is the aircraft generator control unit (GCU).
It schedules valve operation as a function of IDG oil temperature. The engine control system is capable of overriding the generator control unit and opening the IDG air/oil heat exchanger valve. The override is based on engine oil temperature and high rotor speed (N2).

B. IDG Air/Oil Heat Exchanger Valve (Ref. Fig. 003)

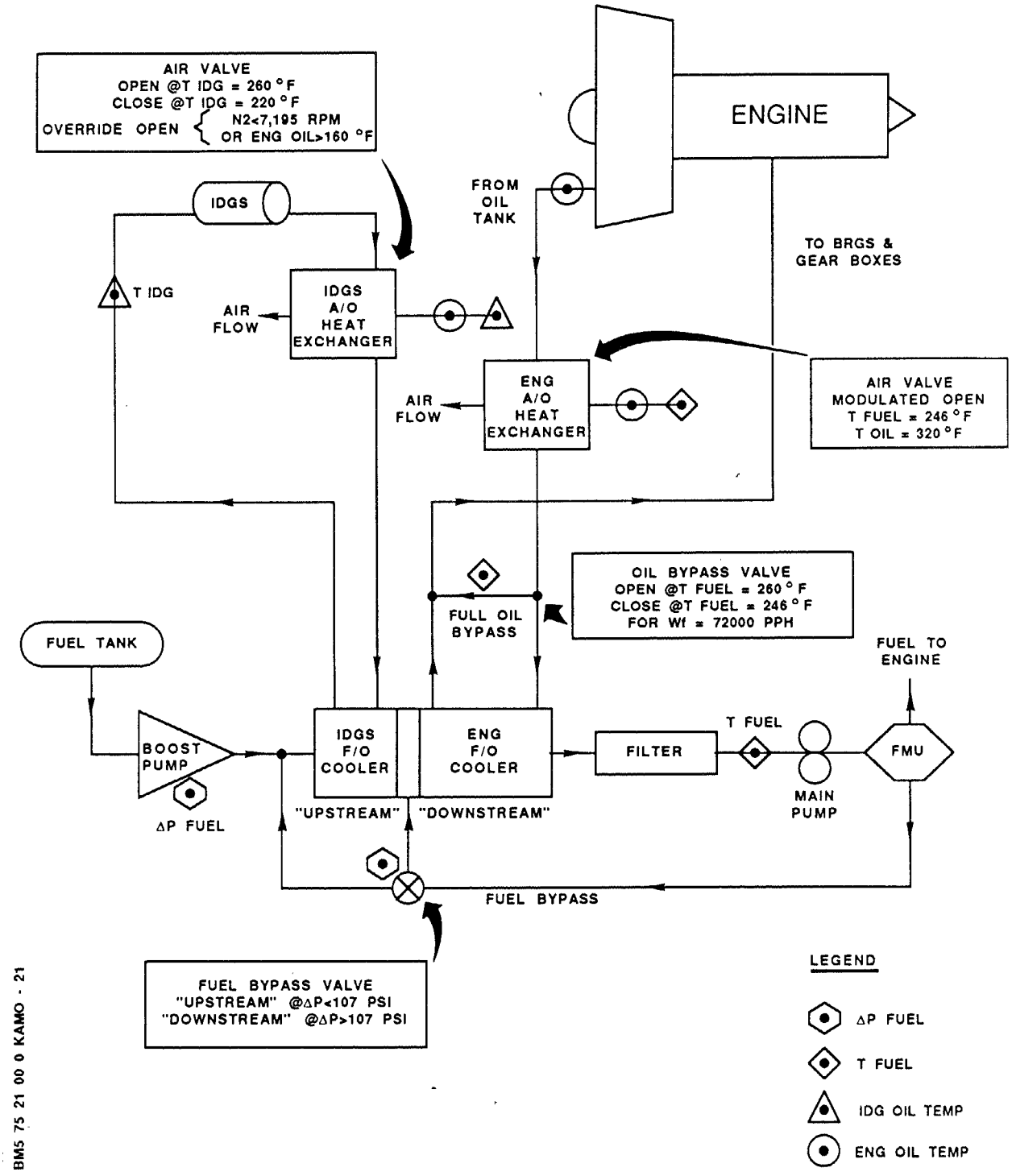
This valve uses the fuel pressure from the engine fuel pump as hydraulic pressure to activate its piston.
This valve contains in fact two butterfly valves in the same housing. These two valves are controlled by the same actuator.
The air/oil heat exchanger valve is enclosed in a fireshield (fireproof envelope).

C. IDG Air/Oil Heat Exchanger Installation (Ref. Fig. 004)

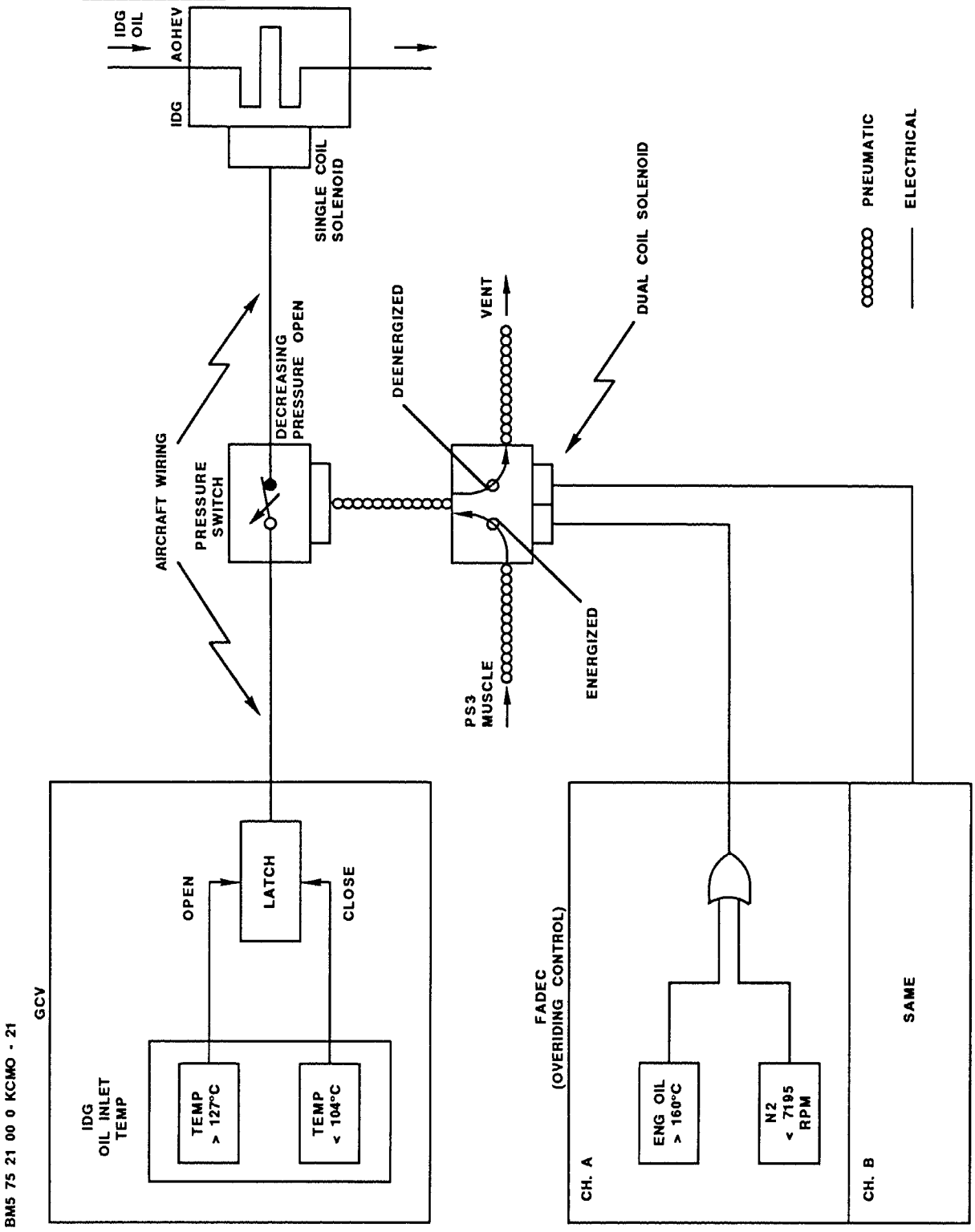
The heat exchanger and valve are mounted in the intermediate case at 4 o'clock position.

D. Electrical Supply (Ref. Fig. 005)

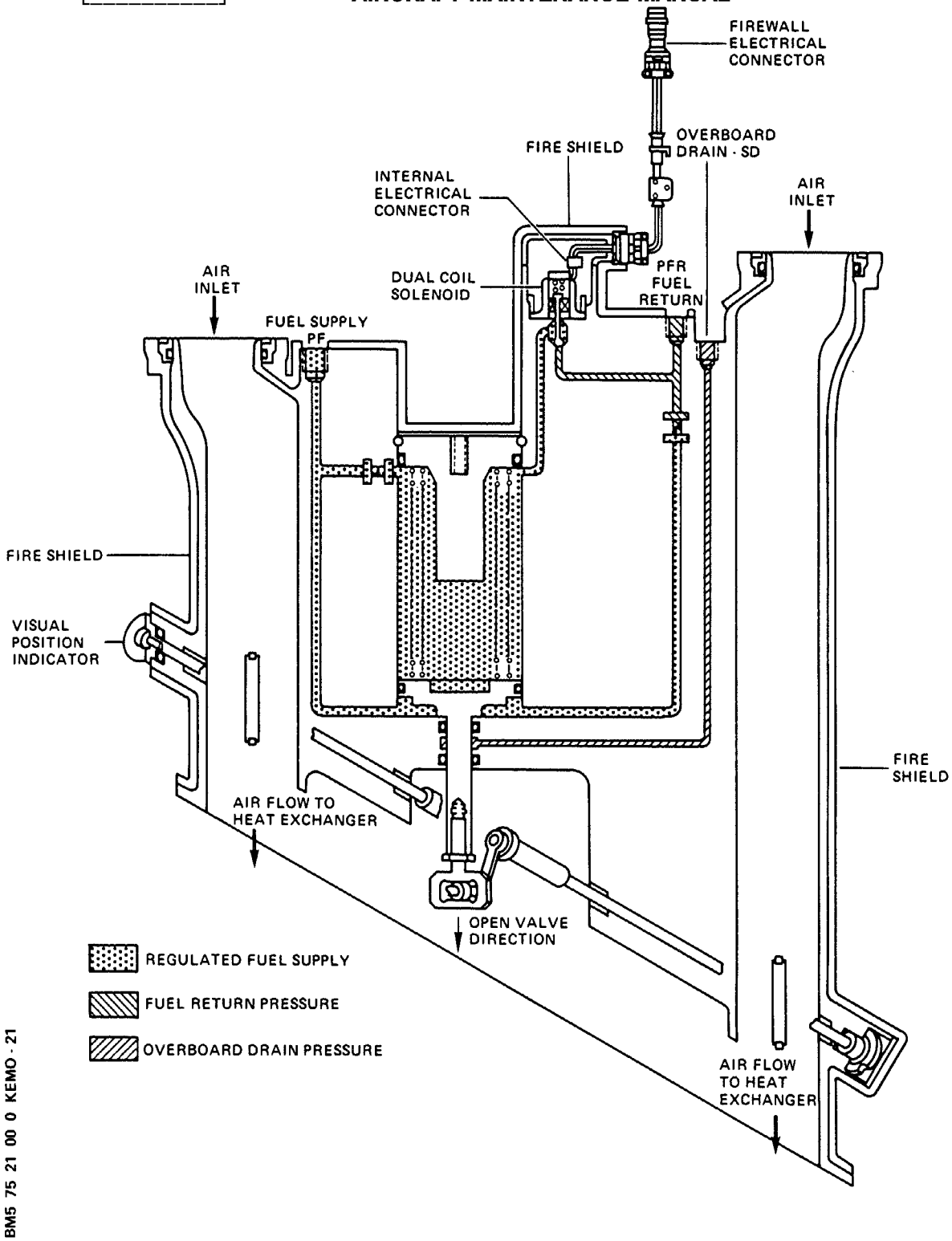
Electrical power is supplied by the aircraft normal busbars 102PP and 104PP for overriding control and by busbars 106PP and 104PP for GCU control (Ref. 24-22-00).



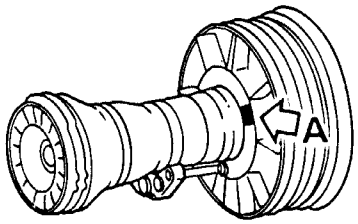
IDG Schematic Air/Oil Heat Exchanger
Figure 001

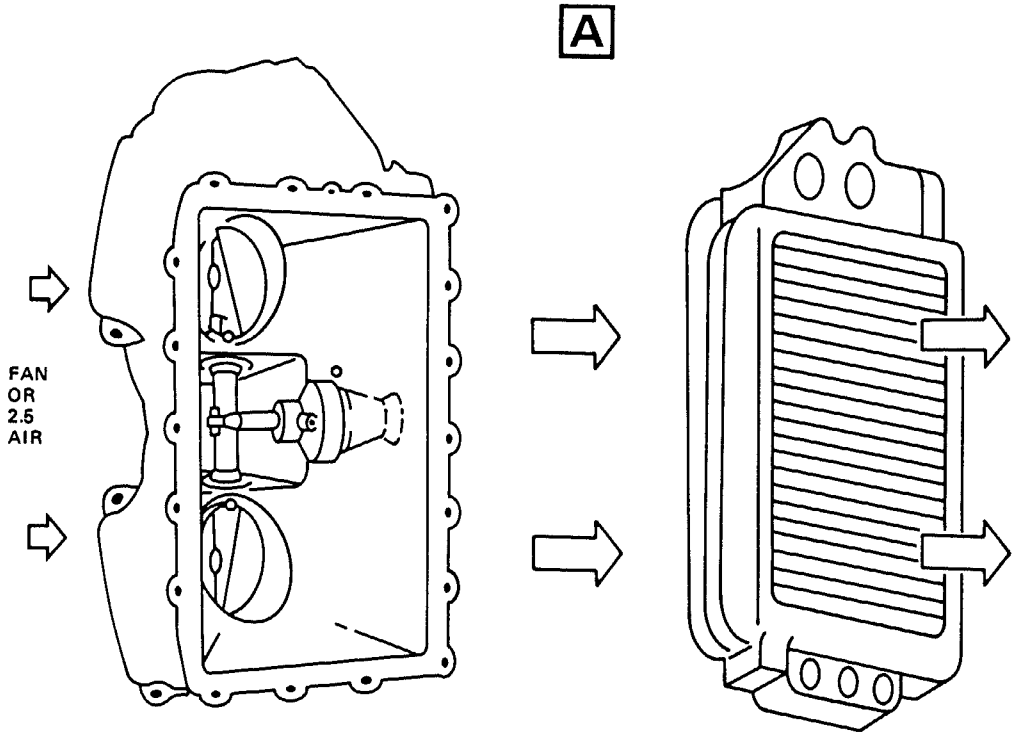


IDG AOHEV Override
Figure 002



IDG's Air/Oil Heat Exchanger Valve-Schematic
Figure 003





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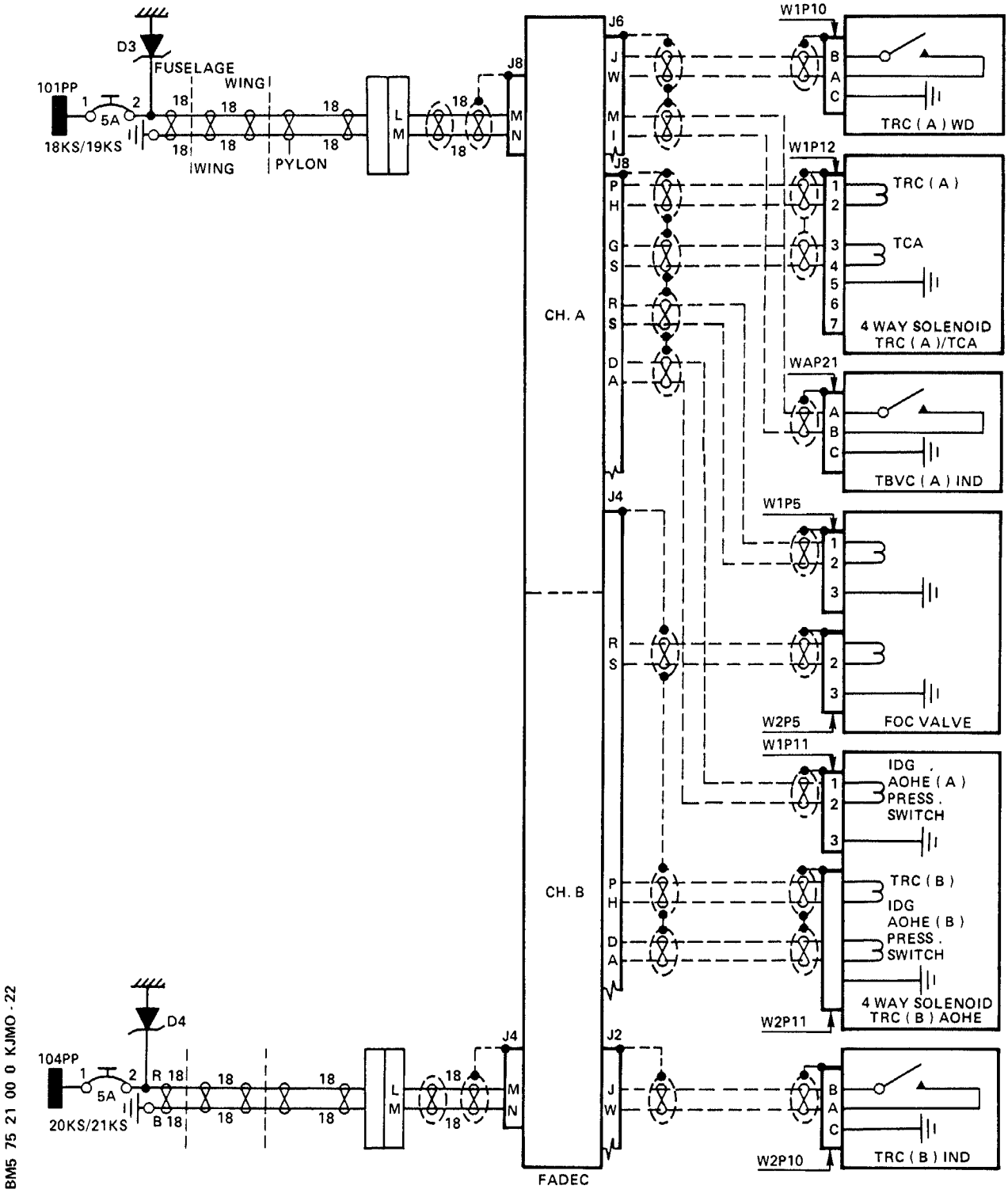
IDG Air/Oil Heat Exchanger-Location
Figure 004



Performance Solenoids Power Supply
Figure 005

ENGINE AIR/OIL COOLING - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
   Engine oil cooling is normally achieved through a fuel/oil cooler, installed within the nacelle (Ref. 79-21-00). Additional cooling when required is provided by an air/oil heat exchanger, and a No. 3 bearing buffer air cooler. Airflow from fan exit case through this heat exchanger is controlled by the FADEC.

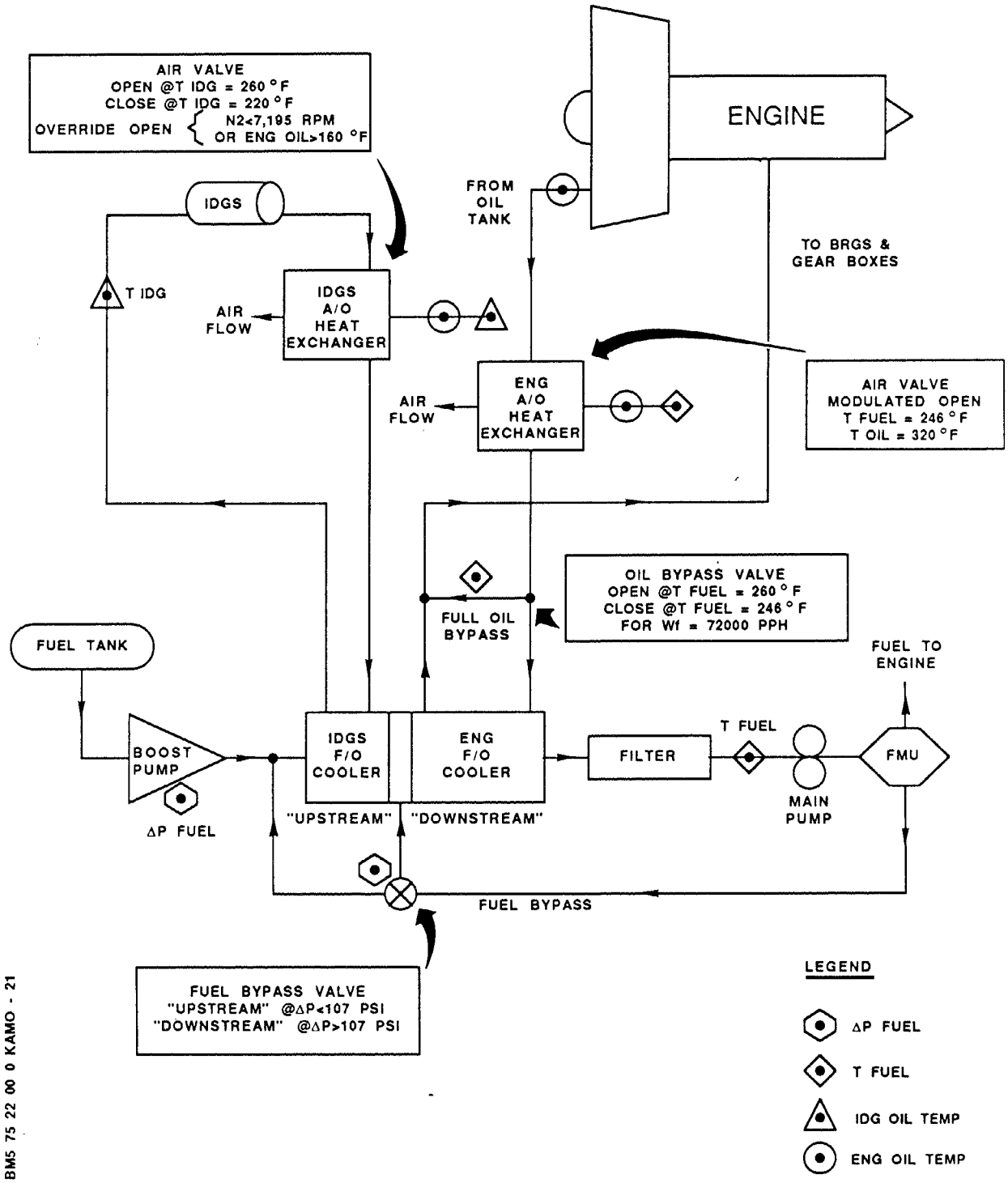
2. Description

   A. The air/oil heat exchanger receives modulated engine fan exit air and at idle 2.5 compressor bleed air discharges via an air flow control valve when the fuel temperature exceeds 121°C (246°F).
   The FADEC interfaces with the air/oil heat exchanger actuator through a redundant coil torque motor driven flapper valve. Air/oil heat exchanger valve position is sensed by dual rotational variable transformers (RVT) and fed back to the FADEC. The torque motor RVT's and actuator are integral with the air/oil heat exchanger valve assembly. The actuator is powered by the fuel hydraulic pressure supplied by the fuel pump.

   B. The modulated air/oil heat exchanger valve (Ref. Fig. 002) is of similar principle as the IDG 2 position air/oil heat exchanger valve, utilizing fuel pressure actuation of the valve enclosed in a fire-proof envelope.
   In case of electrical power loss, the valve will move to the full open position. The valve has a visual position indicator.

   C. No. 3 Bearing Buffer Air Cooler (Ref. Fig. 003)
   The No. 3 bearing buffer air cooler located in the intermediate case at the 2 o'clock location, receives 12th stage HPC bleed air and passes it through a heat exchanger that is cooled by fan discharge air. The cooled 12th stage air then returns to the diffuser case for cooling/insulating the No. 3 bearing compartment from its environment of HPC discharge air.

3. Engine Air/Oil Heat Exchanger Installation (Ref. Fig. 004)
   - The heat exchanger and valve are mounted in the intermediate case at the 8 o'clock position.
   - The oil in and return parts are located on the same side of the heat exchanger, facing aft.



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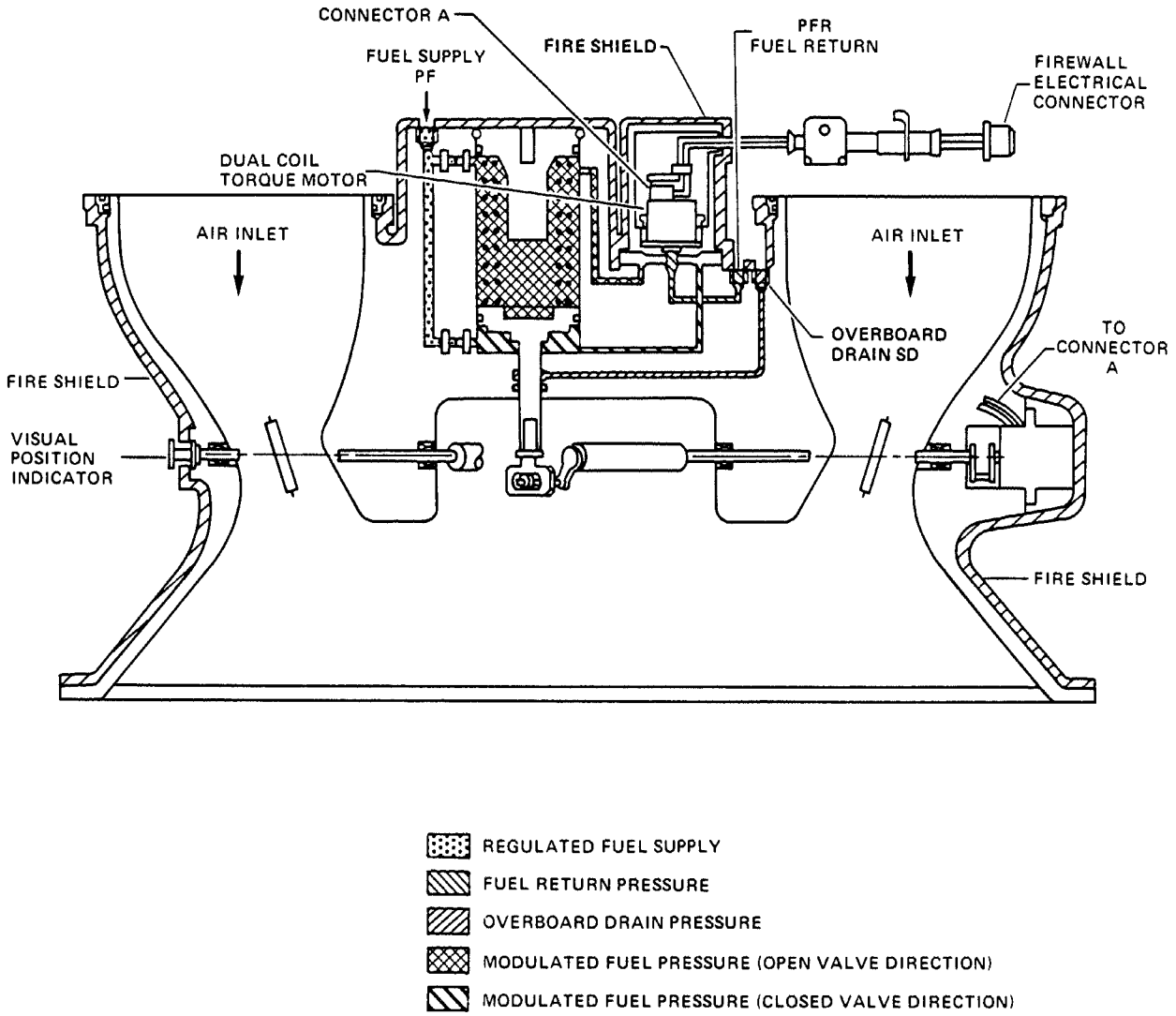
Engine Schematic - Air/Oil Heat Exchanger
Figure 001



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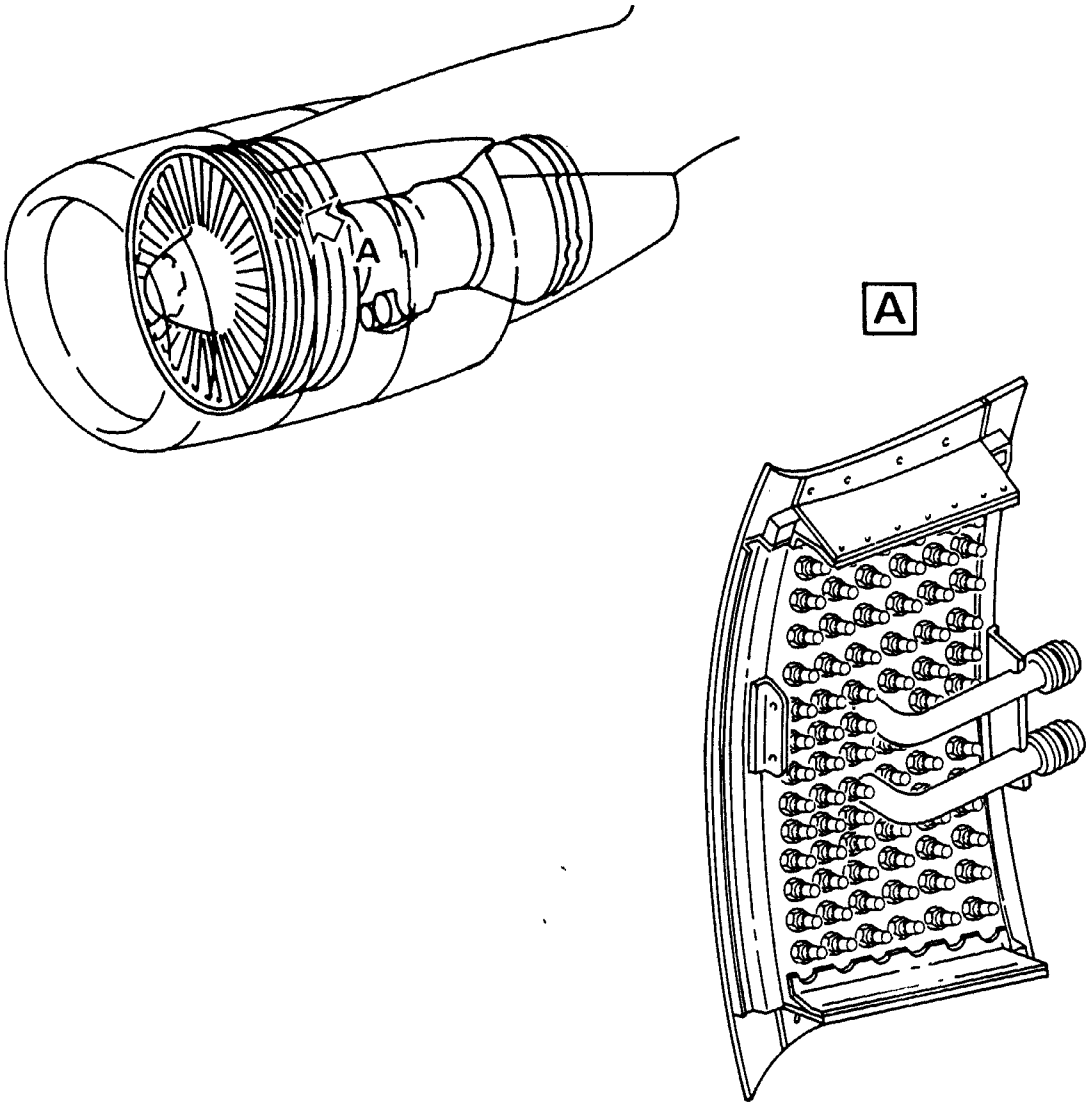
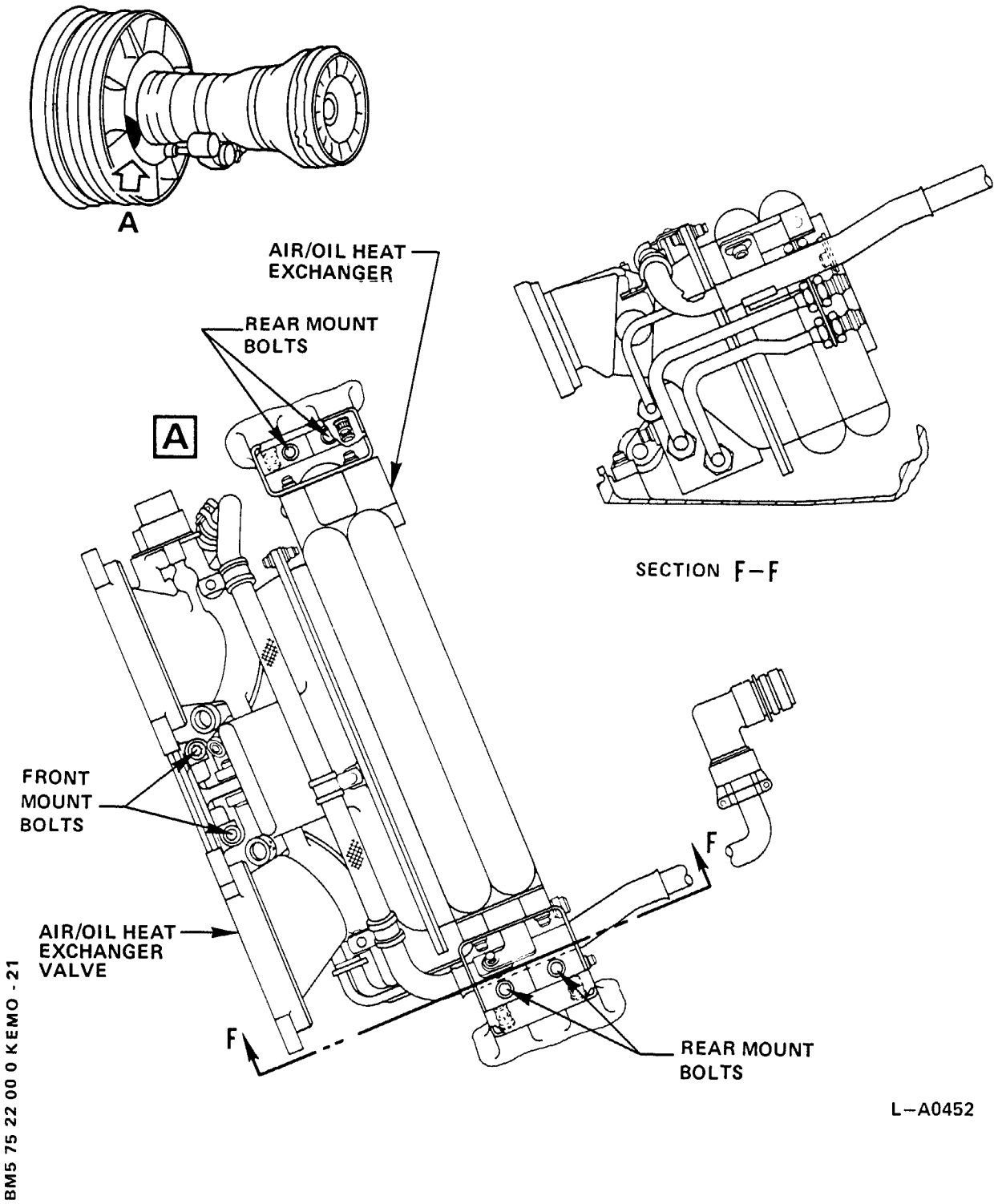
Engine Air/Oil Heat Exchanger Valve-Schematic
Figure 002



No. 3 Bearing Buffer Air Cooler
Figure 003



Engine Air/Oil Heat Exchanger
Figure 004

No. 3 BEARING BUFFER AIR COOLER - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Closures
C.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
D.	Access Platform
E.	Torque Wrench
F. Material No.P03-001	Oils (Ref. 70-00-00)
G. Material No.P05-038	Special Materials (Ref. 70-00-00)
R H. Material No.P06-054	Lubricants (Ref. 70-00-00)
J. Material No.P09-027	Sealants (Ref. 70-00-00)
K. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers.
(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(3)Install access platform.

B. Removal (Ref. Fig. 401)
WARNING : PERMIT SUFFICIENT TIME AFTER THE ENGINE SHUTDOWN FOR THE BUFFER AIR COOLER OF THE NO. 3 BEARING TO DECREASE IN TEMPERATURE. ALSO PERMIT THE RELATED TUBES OF THE NO. 3 BEARING TO DECREASE IN TEMPERATURE. IF YOU DO NOT OBEY THESE INSTRUCTIONS, YOU CAN GET BAD BURNS.
(1)If there is sealant around the edges of the air cooler, cut the sealant.
(2)Remove lockwire and disconnect the two tube nuts attached to No. 3 bearing buffer air cooler assembly (called cooler).
(3)Remove screws securing cooler to intermediate case.
(4)Remove bolts securing cooler to mount bracket. Remove cooler and classified spacer.
NOTE : Keep classified spacer with cooler.
(5)Remove midspan support as follows :
(a)Remove bolt securing outer rod end bearing mount bracket to rod end bearing and remove mount bracket.
(b)Remove lockwire from jamnuts and loosen outer jamnut. Remove outer rod end bearing from strut and jamnut from rod end bearing.
(c)Loosen inner jamnut and remove strut. Remove jamnut from inner rod end bearing.
(d)Remove bolt and nut securing inner rod end bearing to mount bracket on intermediate case and remove rod end bearing from bracket.
(6)(Post SB PW4ENG 72-433) If necessary, remove the bolts and nuts that

attach the two supports along the axial edges of the cooler. Remove the supports.

(7)Install protective closures to cooling air tubes.

(8)Mechanically remove any remaining sealant from the case and cooler.

C. Installation (Ref. Fig. 401)

(1)If you do not already know if the spacer plate (called spacer) at the trailing edge of the No. 3 bearing air cooler assembly (called cooler) is the correct class of spacer, choose a classified spacer as follows.

(a)Install the cooler and a spacer on the intermediate case. Use work screws.

(b)Measure the distance between the trailing edge of the cooler and the intermediate case. If the installed spacer does not give the correct fit, choose a spacer that does. Refer to Index 2 of Table 401. (Ref. Fig. 401)

(c)Remove the cooler and spacer.

(2)(Post SB PW4ENG 72-433) If removed, attach the two supports to the axial edges of the cooler with 14 bolts, threads lubricated with Material No.P03-001 and nuts.

Class	Spacer Thickness - Inch (mm)
1	0.022 - 0.028 (0.559 - 0.711)
2	0.036 - 0.044 (0.914 - 1.118)
3	0.058 - 0.068 (1.473 - 1.727)
4	0.075 - 0.085 (1.905 - 2.159)
5	0.095 - 0.105 (2.413 - 2.667)
6	0.120 - 0.130 (3.048 - 3.302)

Spacer Plate Thickness
Table 401

(3)Install the cooler as follows.

(a)Assemble the strut and one rod end bearing and nut, with the threads lubricated with Material No.P03-001, to Dimension AD. Tighten the nut with your hand.

(b)Install the rod end bearing in the bracket at 2 o'clock on the intermediate case. Attach the bearing to the intermediate case with a bolt and nut, threads lubricated with Material No.P03-001. TORQUE nut to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(c)Remove protective closures from ends of cooling tubes.

(d)Attach the mount bracket to the bracket at the front of the cooler with two bolts, lubricated with Material No.P03-001. Tighten the bolts with your hand.

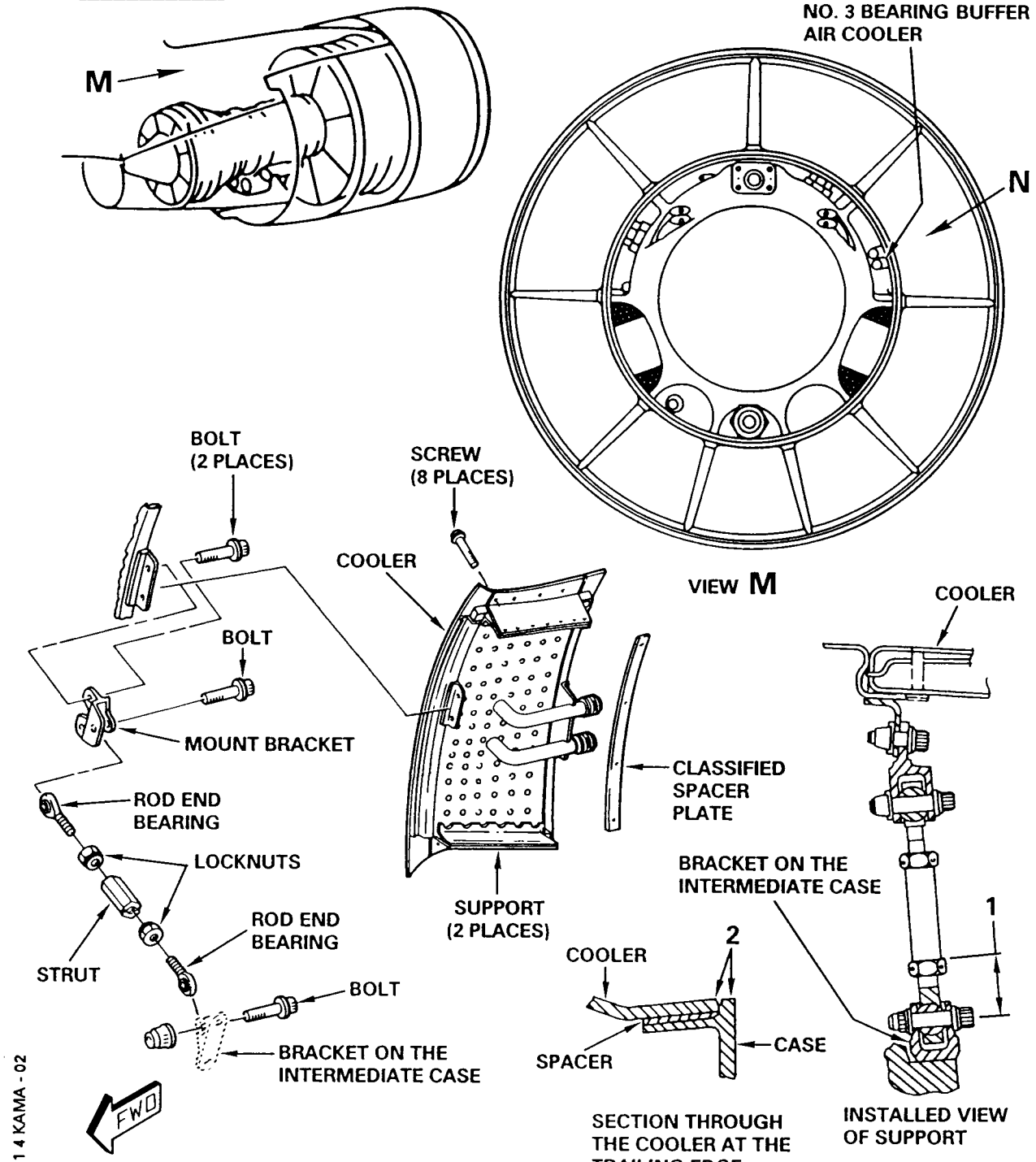
(e)(Pre SB PW4ENG 72-433) Put the cooler and correct classified spacer in the correct position on the intermediate case.

1 Attach the cooler to the intermediate case with eight screws, lubricated with Material No.P03-001. TORQUE the screws to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

2 Do a check of the cooler. It must agree with Index 2 of the referenced figure. If not, remove the cooler and choose a new spacer.

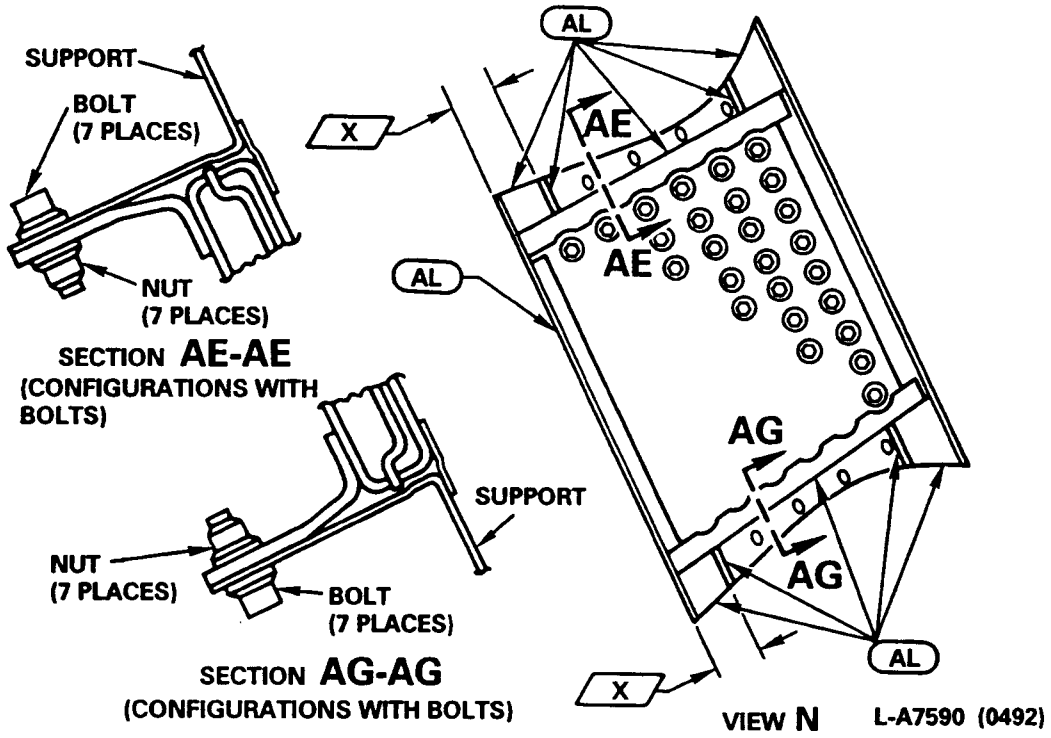
(f)Assemble the remaining rod end bearing and nut, threads lubricated with Material No.P03-001, to the strut. Tighten the nut with your hand.
(g)Attach the outer rod end bearing to the mount bracket with a bolt lubricated with Material No.P03-001. Tighten the bolt with your hand.
(h)After final adjustment, examine the inspection holes on the strut. Obstruction of the holes indicates correct engagement.
(i)TORQUE the nuts at either end of the strut to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN). Install lockwire in the nuts.
(j)TORQUE the bolt that attaches the outer rod end bearing to the mount bracket to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
(k)TORQUE the bolts that attach the mount bracket to the cooler bracket to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
(l)(Post SB PW4ENG 72-433) Install the cooler as follows :
1 Loosen the 14 bolts and nuts in the supports at the axial edges of the cooler.
2 Install the cooler and spacer on the intermediate case.
3 Measure the distance between the cooler and the intermediate case at the trailing edge. If necessary, choose a new spacer for the correct fit. Refer to the Index 2 dimension.
4 TORQUE the bolts and nuts in the supports to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
5 Attach the cooler with eight screws, lubricated with Material No.P03-001. TORQUE the screws to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(m)Apply sealant around the edges of the cooler at AL as follows :
1 Make a piece of clean Cheesecloth Material No.P05-038 wet with Material No.P11-014. Clean the edges of the cooler.
2 Dry the cleaned areas fully in the adjacent air. There must not be any alcohol remaining on the surfaces.
3 In less than two hours after you cleaned the parts, fill the spaces at AL with Material No.P09-027.
4 Cure the sealant in adjacent air that has a 25 percent relative humidity, minimum, for eight hours, minimum, before you run the engine.
(n)Attach cooling air tubes to adapters lubricated with Material
R No.P06-054, on cooler. TORQUE tube nuts to between 825 and 900 lbf.in. (9.32 and 10.17 m.daN). Wirelock tube nuts.

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers.
(5)Test engine. Refer to the Test Reference Table (Ref. 71-00-00, P. Block 501).



1. 1.000 INCH (25.400 mm) REFERENCE DIMENSION AD
2. THESE SURFACES MUST BE EVEN WITHIN 0.020 INCH (0.508 mm), EXCEPT AT X. THESE SURFACES MUST BE EVEN WITHIN 0.080 INCH (2.032 mm), TWO PLACES AT X. CHOOSE THE CORRECT CLASS OF SPACER.

No. 3 Bearing Buffer Air Cooler and Support (Sheet 1/2)
Figure 401



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No. 3 Bearing Buffer Air Cooler and Support (Sheet 2/2)
Figure 401

R # AUTOMATIC TURBINE ROTOR CLEARANCE CONTROL SYSTEM (ATRCCS) - DESCRIPTION AND OPERATION

1. General

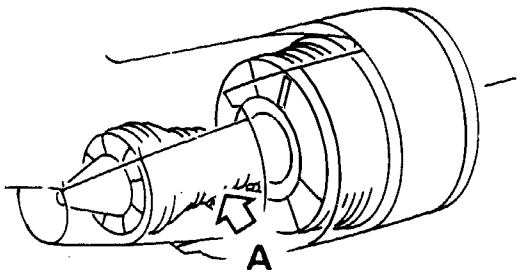
The engines incorporate high and low pressure turbine cases equipped with an automatic turbine rotor clearance control system (ATRCCS). The ATRCCS is also refered to as the Turbine Case Cooling System (TCCS).

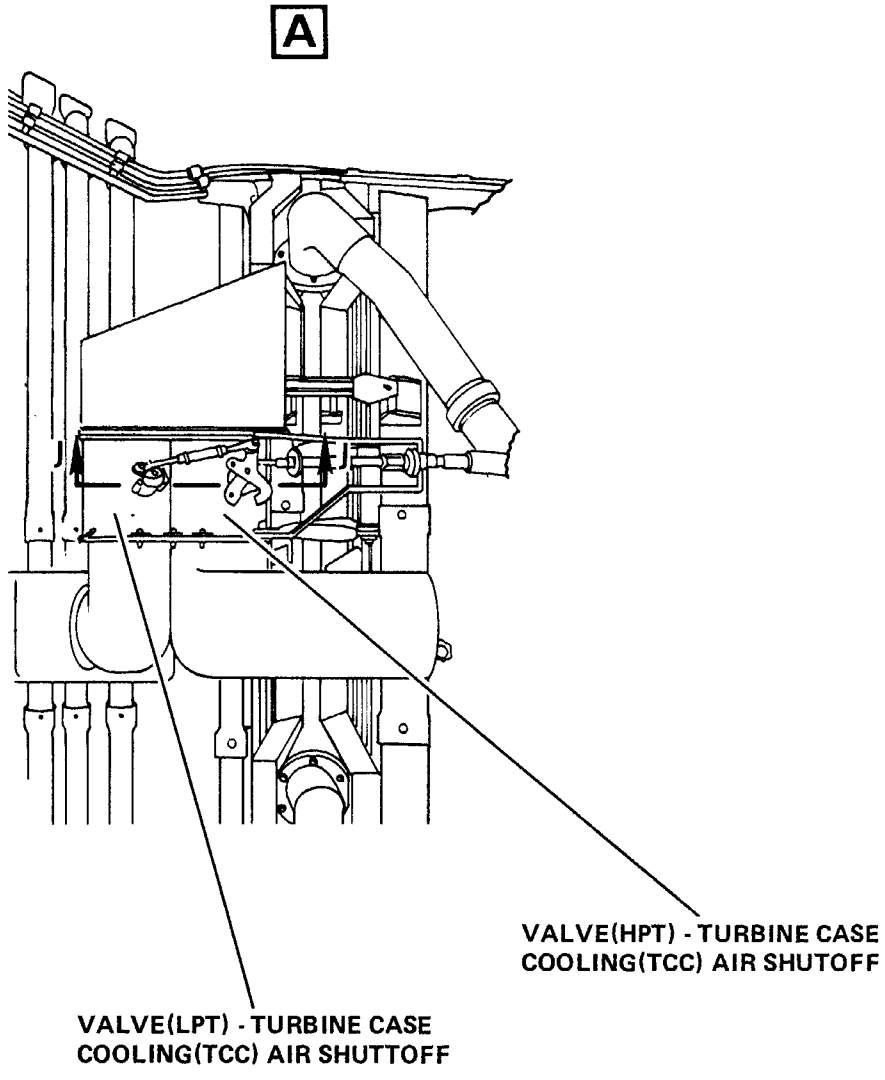
The system reduces engine fuel consumption by improving turbine efficiency as a result of turbine blade tip clearance reduction caused by cooling the outer surface of the turbine case with fan air.

2. Component Location

(Ref. Fig. 001)

FIN	FUNCTIONAL DESIGNATION	PANEL	ZONE	ACCESS DOOR	ATA REF.
	VALVE (HPT) - TURBINE CASE COOLING		456	452AR	75-23-02
	(TCC) AIR SHUTOFF		466	462AR	75-23-02
	VALVE (LPT) - TURBINE CASE COOLING		456	452AR	75-23-04
	(TCC) AIR SHUTOFF		466	462AR	75-23-04
	ACTUATOR - TURBINE CASE COOLING		456	452AR	75-23-05
	(TCC) AIR VALVE		466	462AR	75-23-05





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TCCS - Component Location
Figure 001

3. Turbine Case Cooling System (Ref. Fig. 002, 003, 004) (Ref. Fig. 005)

A. The air used to cool the turbine is drawn from the fan exit duct. An engine mounted duct interfaces with a nacelle-mounted inlet and directs the flow to the high and low pressure turbine case cooling valves located on the turbine case.

B. The turbine cases cooling actuator position is scheduled as a function of altitude and high rotor speed (N2).

C. The FADEC interfaces with the turbine case cooling actuator (TCCA) through a pilot valve positioned by a redundant coil torque motor. TCCA position is sensed by dual linear variable differential transformers (LVDT) and fed back to the FADEC.
The pilot valve, torque motor and LVDT's are integral with the TCC actuator.
The actuator is powered by fuel hydraulic pressure supplied by the fuel pump.

D. The linear motion of the actuator piston is transmitted to the high and low pressure turbine case cooling air valves by a push-pull cable.

E. The high and low pressure turbine case cooling air valves (one each) are mechanically actuated, fully modulated, spring loaded closed butterfly valves mounted in tandem with a common inlet. Their relative schedules are controlled by a fixed geometry mechanical linkage which starts to open the low pressure turbine case cooling air shut-off valve before the high pressure turbine case cooling air shut-off valve starts to open.
NOTE : In the event of loss of electrical power or hydraulic pressure or mechanical connection, the system is designed to close the cooling air valves.

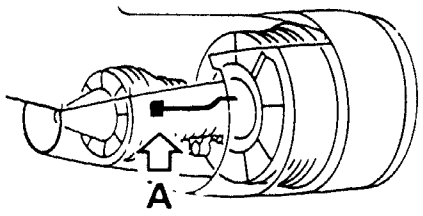
4. Turbine Case Cooling (TCC) Air Shutoff Valve (HPT) (Ref. Fig. 006)

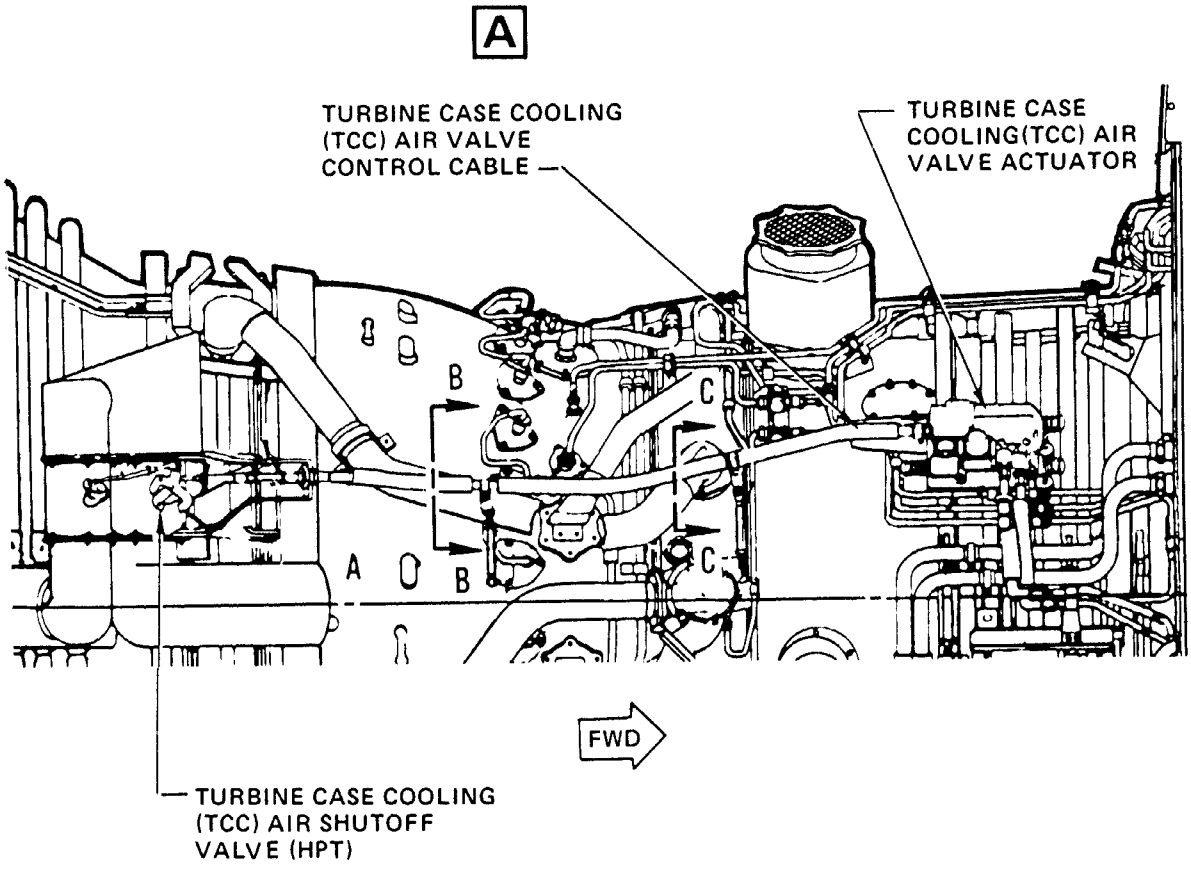
A. The turbine case cooling (TCC) air shutoff valve (HPT) provides cooling air externally to the high pressure turbine case to optimize turbine blade-to-case clearances.

B. The HPT and LPT/TCC air valves are mechanically connected through a ratio linkage system and are fully modulated via a flexible shaft (push-pull cable) connected to a hydraulic actuator.

C. The HPT 4.5 in (114.300 mm) (ID Bore) butterfly valve controls air flow from fan discharge to manifolds surrounding the high turbine case. Air bleed holes in the manifolds face the turbine cases to direct cooling air externally on the turbine case to minimize turbine case growth due to thermal expansion.

5. Turbine Case Cooling (TCC) Air Shutoff Valve (LPT) (Ref. Fig. 007)





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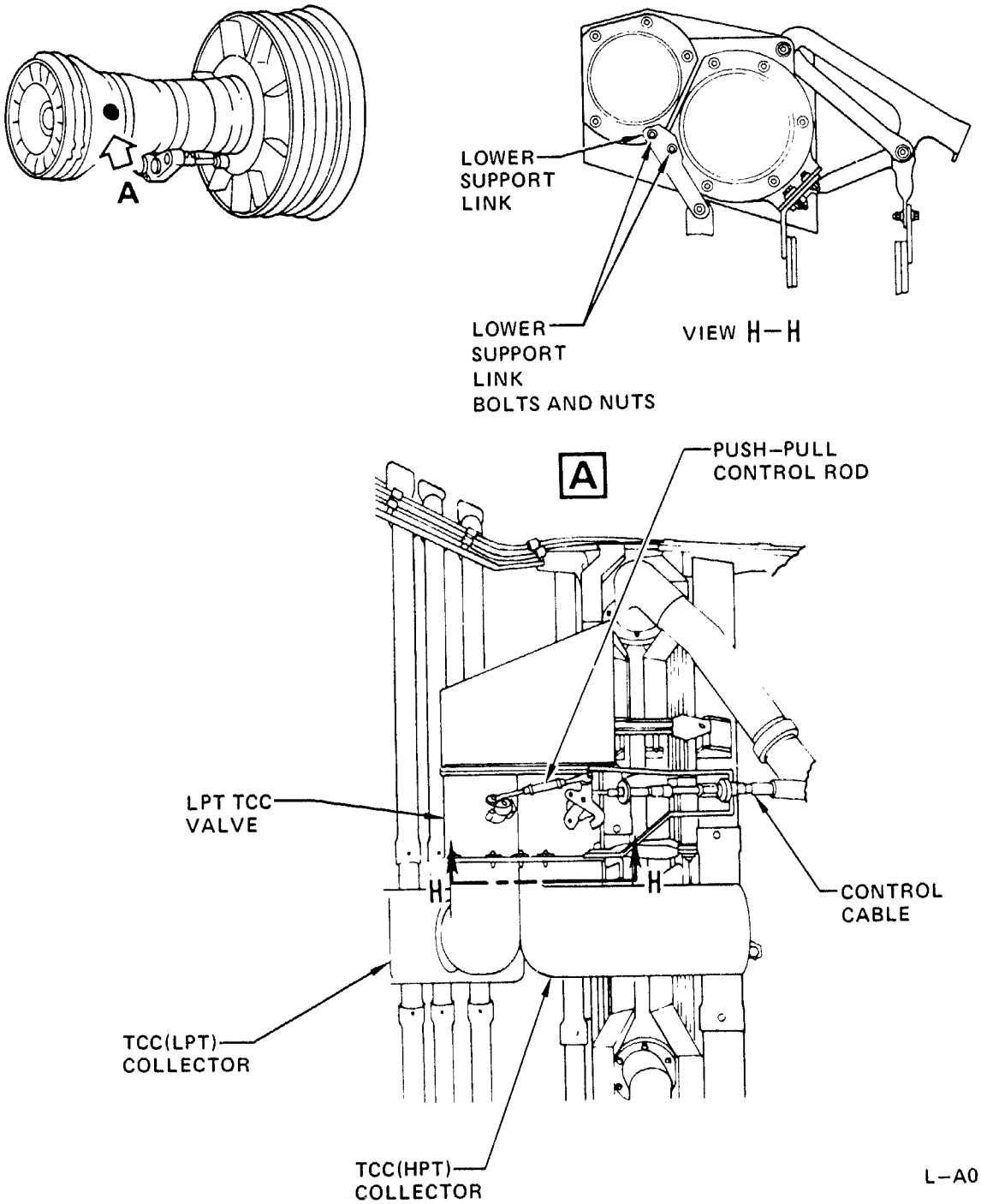
Turbine Case Cooling Component Location
Figure 002



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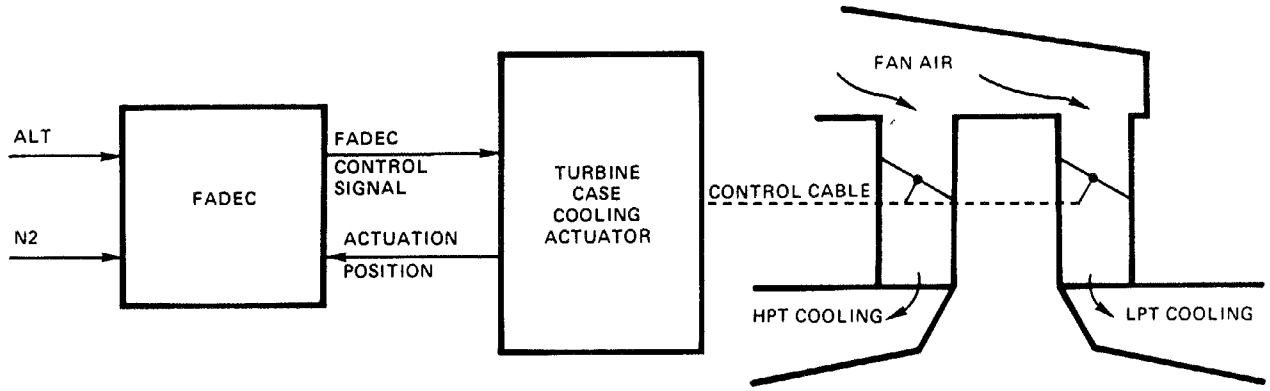
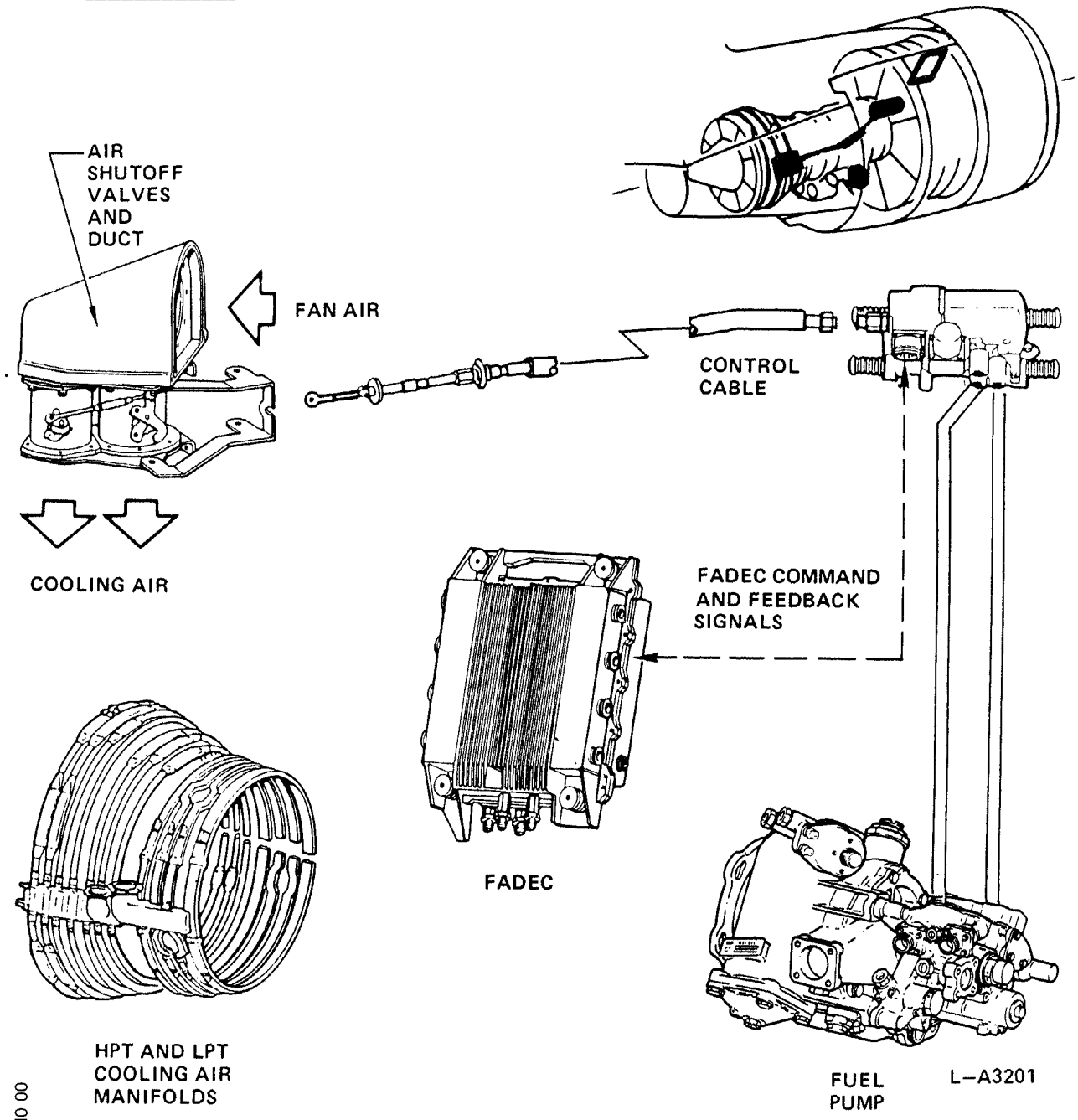
LPT and HPT Air Shutoff Valves Location
Figure 003



BM5 75 23 00 0 KEM0 00

Turbine Case Cooling Schematic Control System
Figure 004



BM5 75 23 00 0 KGN0 00

Turbine Case Cooling
Figure 005

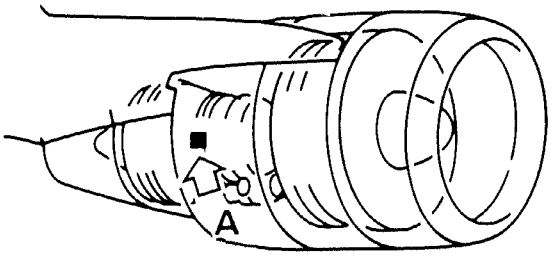
A. The turbine case cooling (TCC) air shutoff valve (LPT) provides cooling air externally to the low pressure turbine case to optimize turbine blade-to-case clearances.

B. The HPT and LPT, TCC air valves are mechanically connected through a ratio linkage system and are fully modulated via a flexible shaft (push-pull cable) connected to a hydraulic actuator.

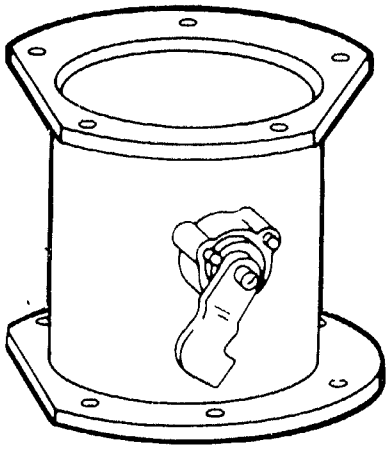
C. The LPT 3.75 in (95.250 mm) (ID Bore) butterfly valve controls air flow from fan discharge to manifolds surrounding the low turbine case. Air bleed holes in the manifolds face the turbine cases to direct cooling air externally on the turbine case to minimize turbine case growth due to thermal expansion.

6. Electrical Supply

A. The electrical power is supplied by the aircraft normal busbar (28VDC) to both channel A and B which control the torque motor of the actuator (Ref. Fig. 008).



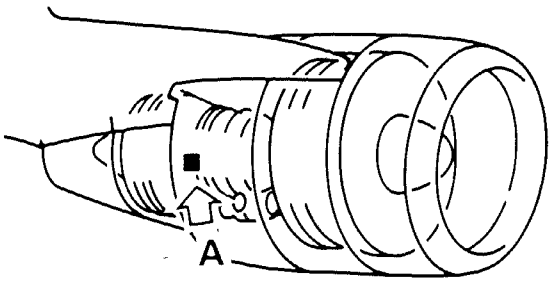
A



L-A3665

BM5 75 23 00 0 KHM0 00

Turbine Case Cooling (TCC) Air Shutoff Valve (HPT)
Figure 006



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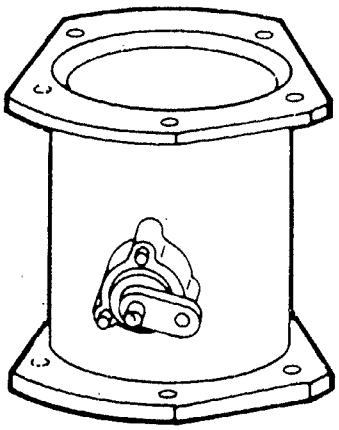

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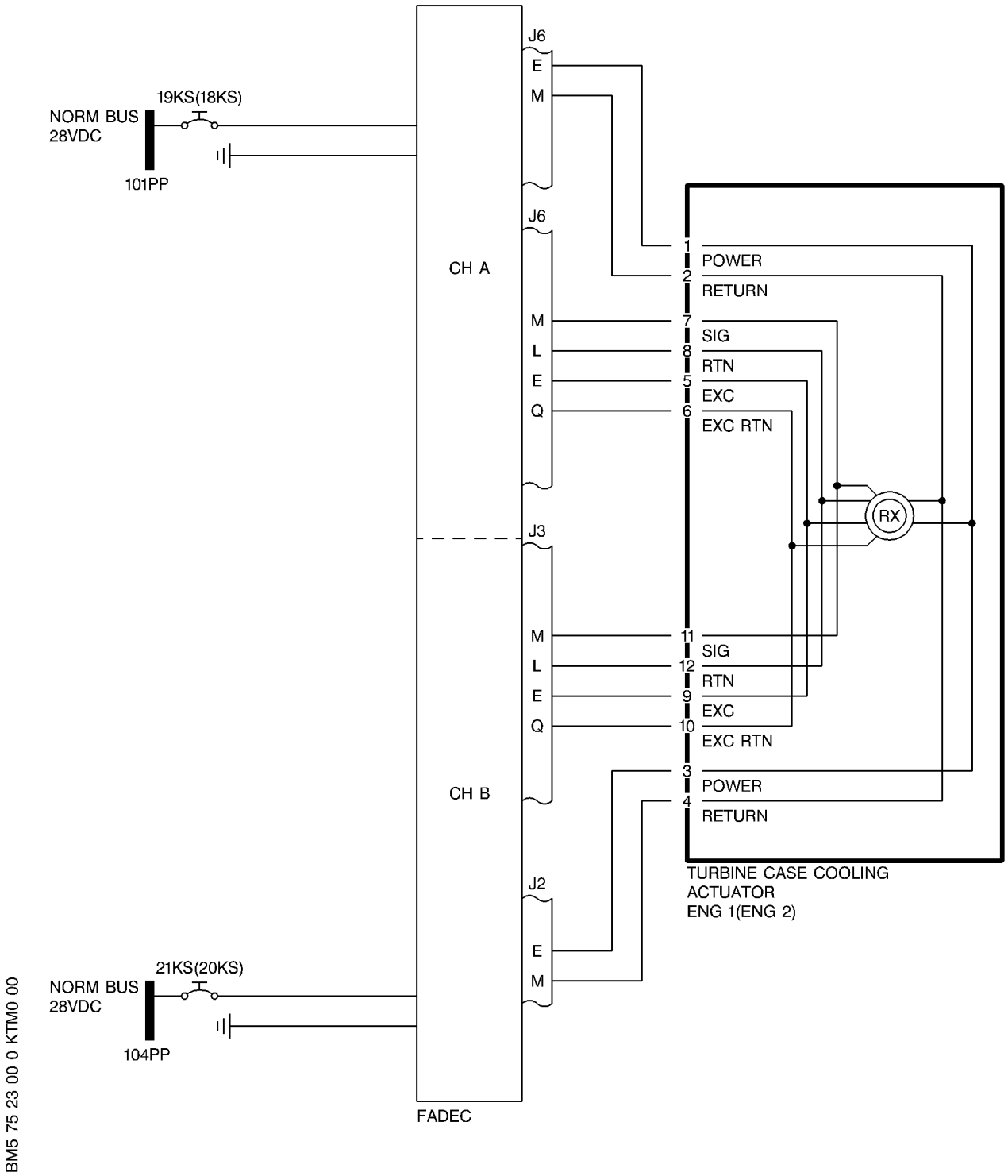
BM5 75 23 00 0 KHN0 00

Turbine Case Cooling (TCC) Air Shutoff Valve (LPT)
Figure 007



Performance Solenoids Power Supply
Figure 008

AUTOMATIC TURBINE ROTOR CLEARANCE CONTROL SYSTEM - ADJUSTMENT/TEST

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C. Material No.P05-289	Special Materials (Ref. 70-00-00)
D. Material No.P05-291	Special Materials (Ref. 70-00-00)
E. Material No.P05-292	Special Materials (Ref. 70-00-00)
F. PWA86069	Rigging Pin - Undersize
G. PWA85465	Rigging Pin
H. PWA101418	Pusher - Machine Screw Positioning Bolt (Alternate to Pusher See NOTE)
I.	Torque Wrench
J.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

NOTE : Above rigging pin may be contained within the PWA 85675 Rigging Pin Kit.

NOTE : The positioning bolt is a quality standard hexhead bolt with a 8-32 by 1.5 in. (38.1 mm) thread length. With a 1.5 in. (38.1 mm) length bolt and when the rig pin touches bottom (fully seated), approximately 0.125 in. (3.175 mm) of the bolt threads are showing.

2. Job Set-Up

A. Open, safety and tag the appropriate circuit breakers and open fan and right thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

3. Rig the Turbine Case Cooling (TCC) Control System-Check and Partial Rig with Undersize Rigging Pins

NOTE : Use this rigging procedure :
- After the replacement of the (TCC) HPT air shutoff valve and/or
- After the replacement of the (TCC) LPT air shutoff valve and/or
- After the replacement of the (TCC) air valve actuator
- For a check of the entire turbine case cooling control system.

A. Procedure (Ref. Fig. 501, 502)

CAUTION : IF YOU USE A LONGER POSITIONING BOLT OTHER THAN THE SPECIFIED BOLT LENGTH AND YOU TURN THE BOLT UNTIL IT TOUCHES BOTTOM (SEATED), YOU CAN DAMAGE THE ACTUATOR.

(1) Install PWA101418 pusher (or a positioning bolt) into the threaded positioning hole on the rear of the actuator (1) (Ref. Fig. 503). Turn the bolt in and align the piston shaft rig hole with the rigging hole in the actuator housing.

Install a PWA 85465 Rigging Pin in the rigging hole. Feel the rigging pin installation to be sure that the pin is fully engaged into the piston shaft rigging hole.

(2)Hold the HPT valve lever arm (3) against the idler arm (2) during the entire rigging check. Allow no gap between the arms. Install a PWA 86069 Undersize Rigging Pin through the HPT valve lever arm (3) and into the housing rigging hole. If you can not install the pin into the valve housing rigging hole, rig the complete system, Ref. Paragraph 4. If you can install the pin into the valve housing rigging hole, keep the pin installed and continue as follows.

(3)Install one more PWA 86069 Undersize Rigging Pin through the LPT valve lever arm (8) and into the valve housing rigging hole. If you can install the pin into the valve rigging hole, the rigging of the system is satisfactory. If the system is satisfactory, remove the tools per step (7). If you cannot install the pin into the valve housing rigging hole, continue as follows.

(4)Remove the bolt (9) and nut (7) that attach the adjuster rod end (4) to the LPT valve lever arm (8). Align the LPT valve lever arm (8) with the rigging pin hole in the valve housing. Install the (PWA 86069) Rigging Pin.

(5)Remove the lockwire or safety cable and loosen the two adjuster jamnuts (5). Turn the adjuster (6) and align the rod end (4) with the bolthole in the LPT valve lever arm (8). Be sure rod end threads are seen through both sight holes in the adjuster. Install the bolt (9), lubricated with Material No. P03-001, and nut (7) that attach the rod end (4) to the arm (8). TORQUE the nut to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
NOTE : The bolt (9) must be installed from the inside of the LPT lever arm (8).

(6)Tighten and TORQUE the jammuts (5) to between 14 and 16 lbf.in. (0.15 and 0.18 m.daN). Install the lockwire (Material No.P05-289) or safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the jammuts.

(7)Remove all three rigging pins. After the removal of the rigging pins, remove the positioning bolt from the rear of the actuator (1).
CAUTION : BE SURE THE THREE RIGGING PINS AND THE PUSHER (OR THE POSITIONING BOLT) ARE REMOVED FROM THE ENGINE OR DAMAGE CAN RESULT.

4. Rig the Turbine Case Cooling (TCC) Control System - Complete Rig with Standard Rigging Pins

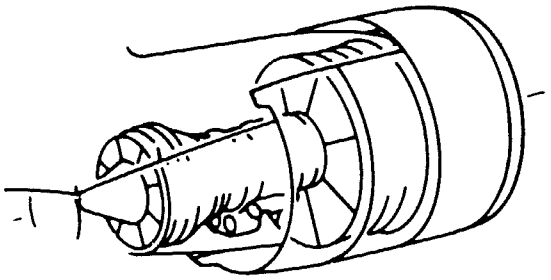
NOTE : Use this procedure only :
- After the replacement of the (TCC) air valve control cable and/or
- If the turbine case cooling control system can not be rigged, Ref. Paragraph 3.

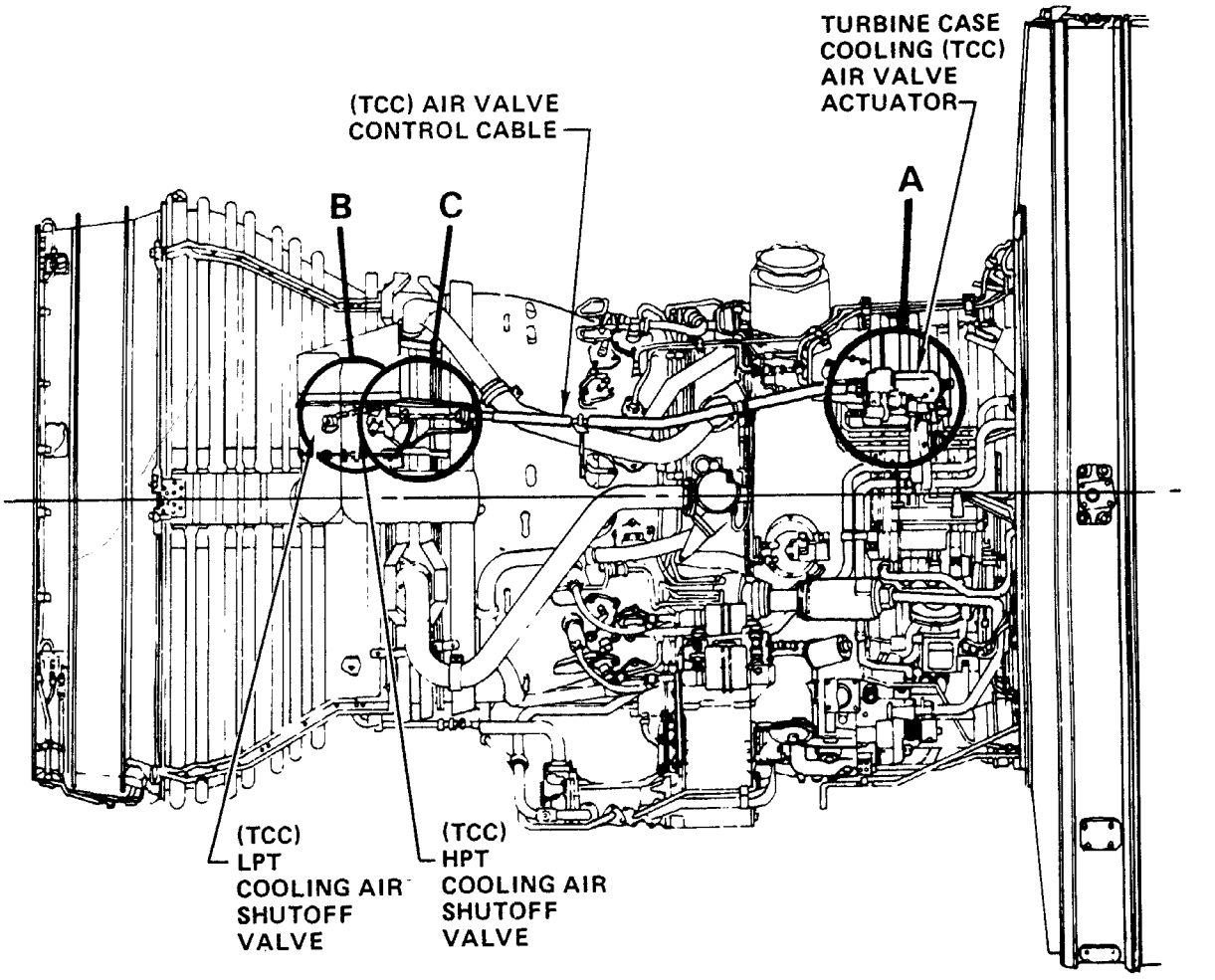
A. Procedure (Ref. Fig. 504, 505)

(1)If the TCC air valve control cable was not replaced or disassembled, do steps (a) and (b) (Ref. Fig. 504, 505) (Sheet 2/4).

(a)Remove the bolt (1) and nut (3) that attach the cable rod end (9).

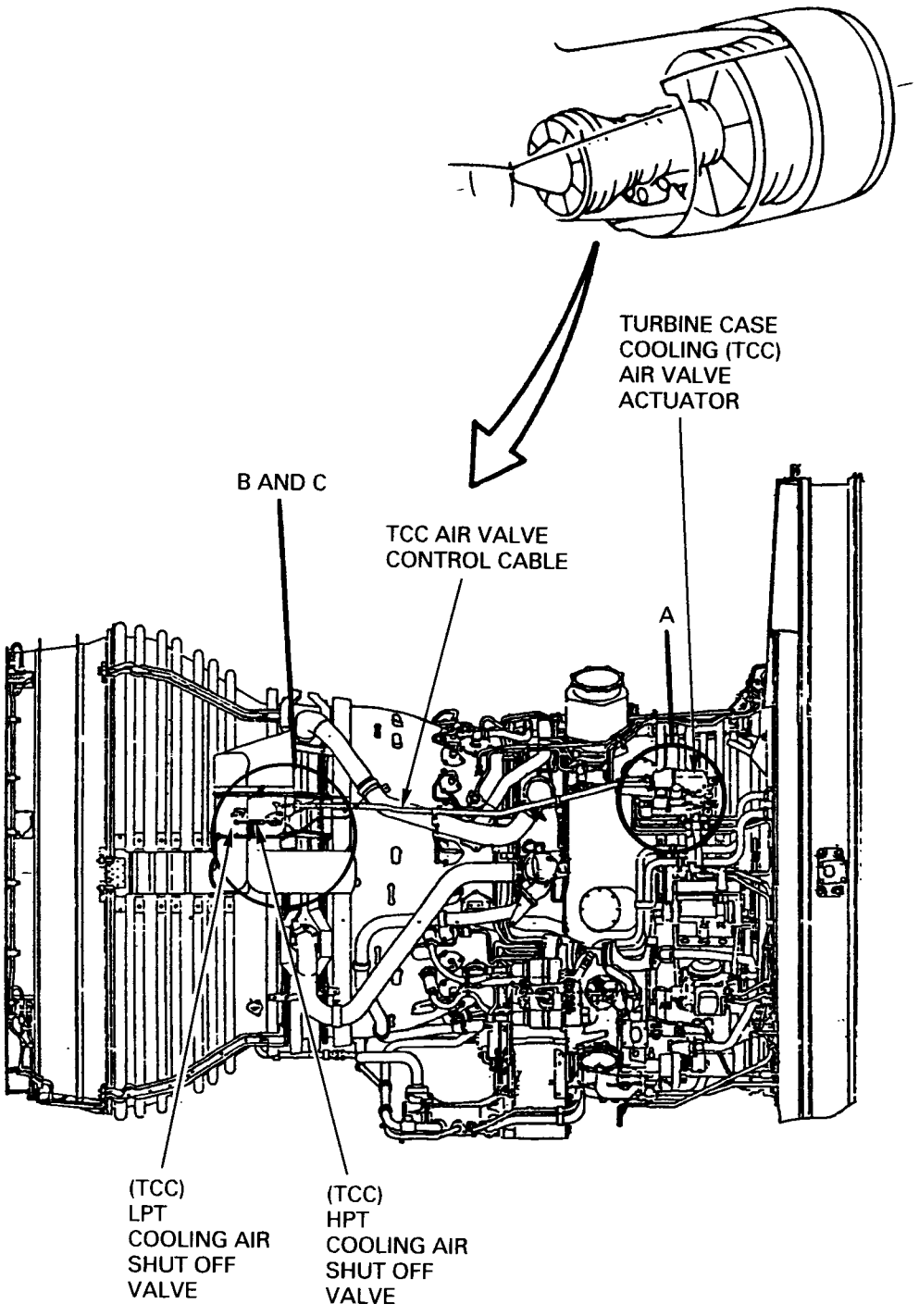
(b)Remove the two bolts (2), nuts (6) and one bushing (4) that attach the adjuster rod ends (5).





BM5 75 23 00 5 KAMA 00

TCC System (Sheet 1/3) (Phase 1 and
Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)
Figure 501



BM5 75 23 00 5 KCMA 00

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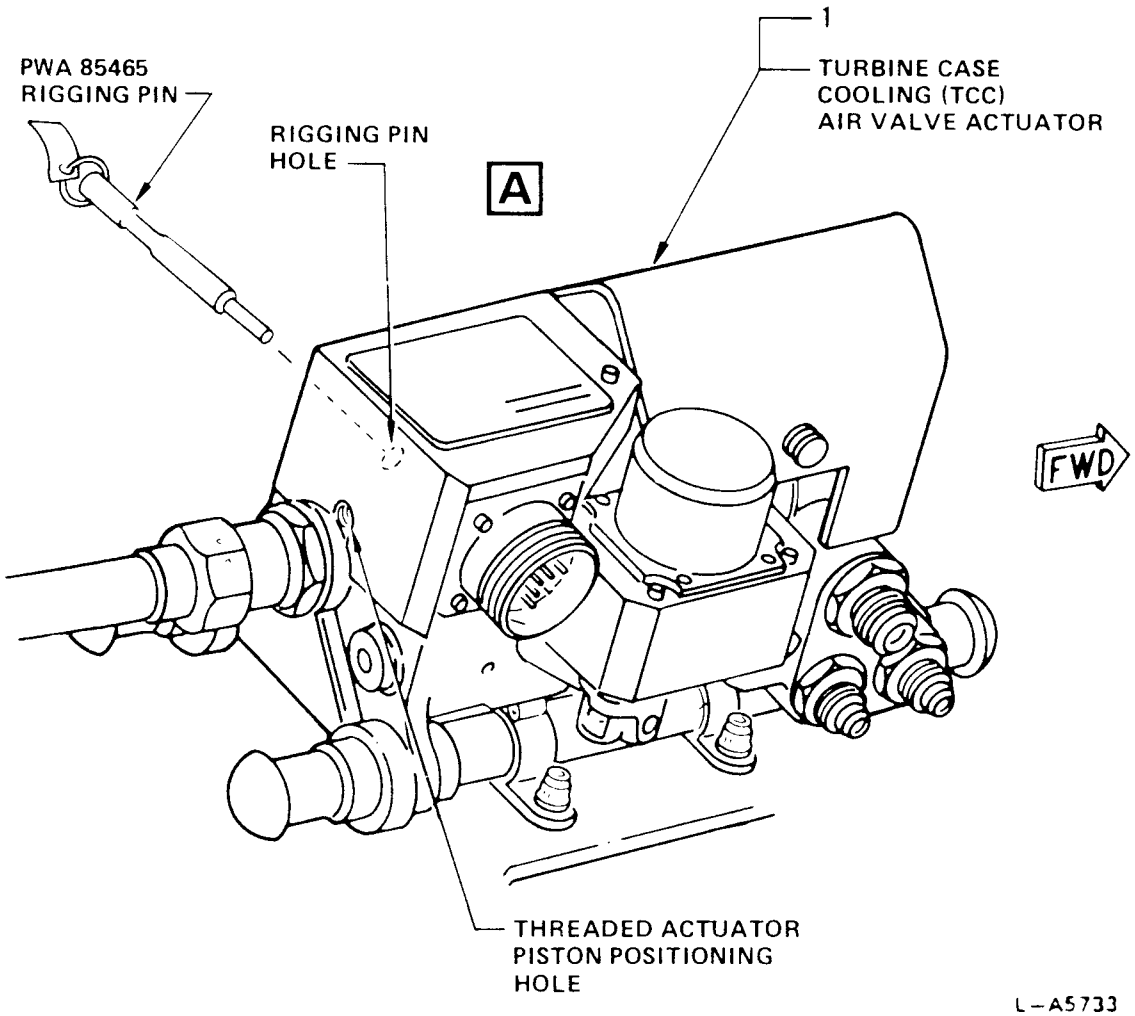
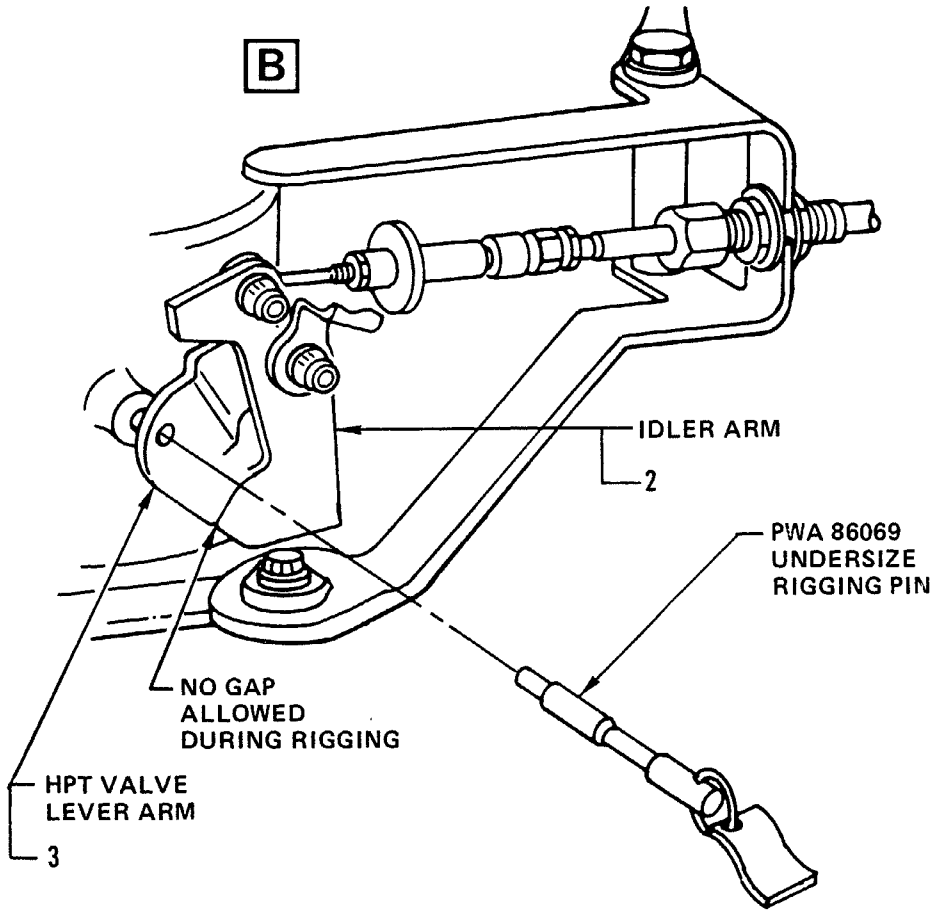
TCC System (Sheet 1/3)
(Phase 3 as Built by P&W)
Figure 502



BM5 75 23 00 5 KRM0 00

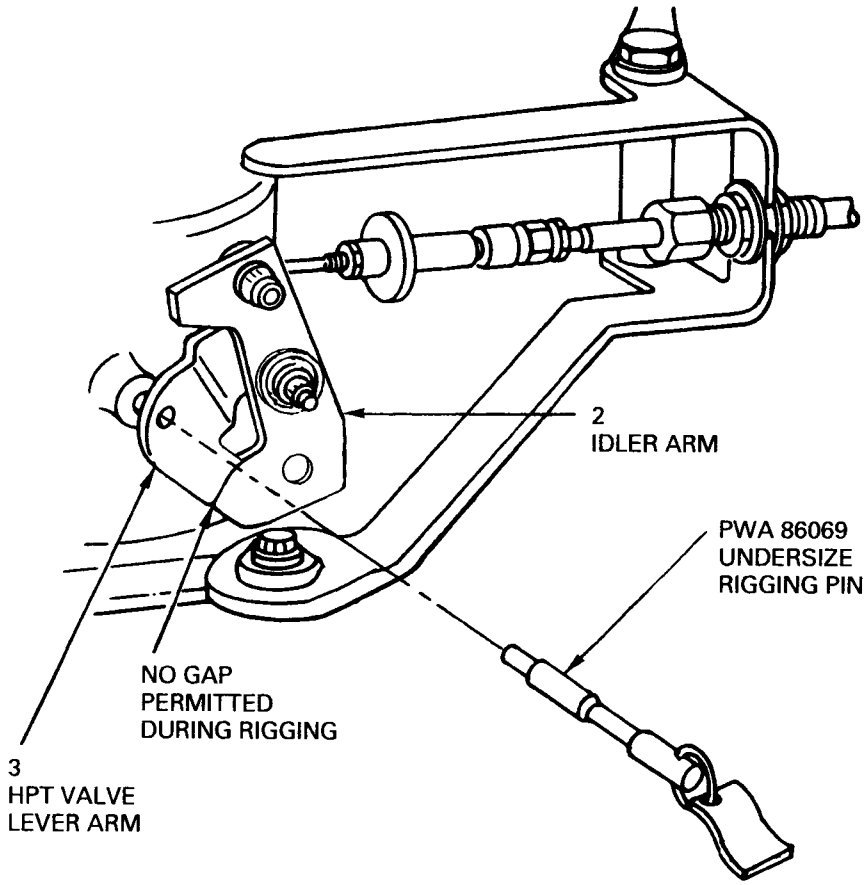
Turbine Case Cooling Control System
Figure 503



L–A5734

BM5 75 23 00 5 KAMC 00

TCC System (Sheet 2/3) (Phase 1 and
Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)
Figure 501

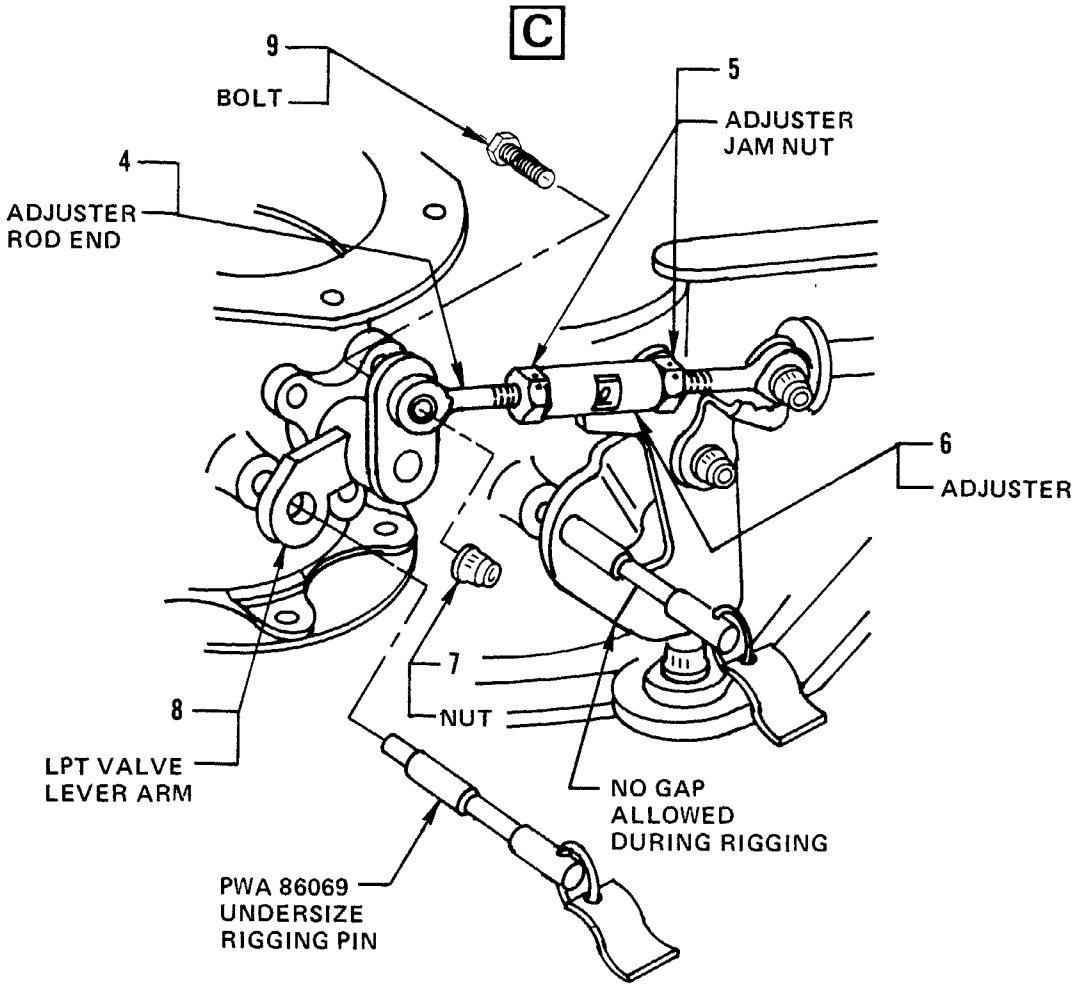


VIEW B

BM5 75 23 00 5 KCMJ 00

L-A9865 (0000)

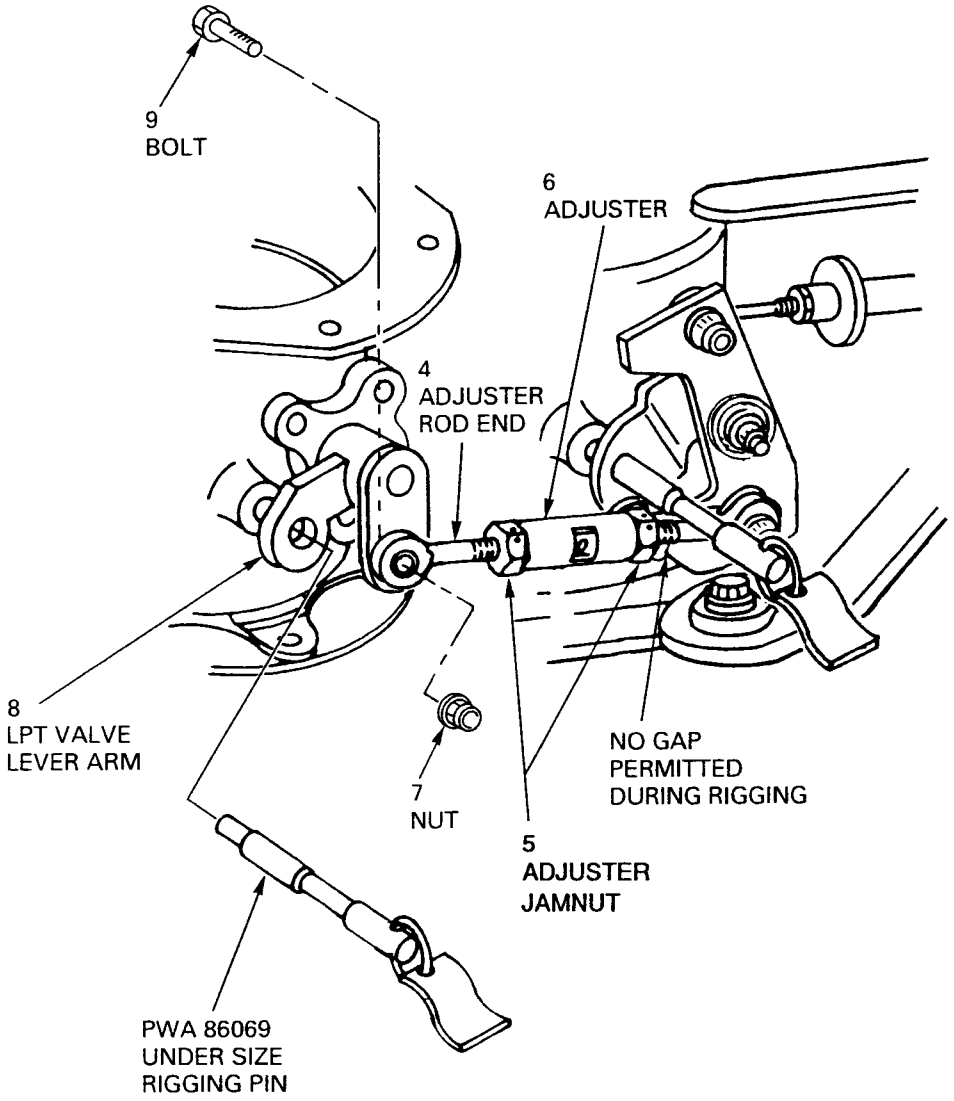
TCC System (Sheet 2/3)
(Phase 3 as Built by P&W)
Figure 502



L—A5735

BM5 75 23 00 5 KAMD 00

TCC System (Sheet 3/3) (Phase 1 and
Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)
Figure 501



VIEW D

L-A9866 (0000)

BM5 75 23 00 5 KCMS 00

TCC System (Sheet 3/3)
(Phase 3 as Built by P&W)
Figure 502

CAUTION : IF YOU USE A LONGER POSITIONING BOLT OTHER THAN THE SPECIFIED BOLT LENGTH AND YOU TURN THE BOLT UNTIL IT TOUCHES BOTTOM (SEATED), YOU CAN DAMAGE THE ACTUATOR.

(2) Install PWA101418 pusher (or a positioning bolt) into the threaded positioning hole on the rear of the actuator (1) (Ref. Fig. 503). Turn the bolt in and align the piston shaft rig hole with the rigging hole in the actuator housing.
Install a PWA 85465 Rigging Pin in the rigging hole. Feel the rigging pin installation to be sure that the pin is fully engaged into the piston shaft rigging hole.

(3) Align the rigging pin hole in the HPT valve lever arm (12) with the hole in the valve housing. Install a PWA 85465 Rigging Pin (Ref. Fig. 504, 505) (Sheet 3/4).

(4) Pull the cable rod end (9) rearward and see if the rod end and the bolthole on the idler arm (11) align. Hold the idler arm (11) against the HPT valve lever arm (12) during this procedure.
NOTE : Allow no gap between the idler arm (11) and the HPT valve lever arm (12) during the entire rigging procedure.

(5) If the bolthole aligns, install the bolt (1) (from the inside) that attaches the cable rod end (9) to the idler arm (11). If the bolthole does not align, remove the lockwire or safety cable from the rod end jammut (13). Loosen the jamnut and adjust the cable rod end (9) to align the bolthole. Install the bolt (1) (from the inside). Tighten and TORQUE the rod end jamnut (13) to between 32 and 36 lbf.in. (0.36 and 0.40 m.daN). Install the lockwire (Material No.P05-289) or safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the jamnut.

(6) Lubricate the threads of bolt (1) with Material No.P03-001 and install the nut (3). TORQUE the nut to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
NOTE : Be sure and install the cable rod end (9) and the head of bolt (1) to the inside of the idler arm (11).

(7) Align the rigging pin hole in the LPT valve lever arm (14) with the hole in the valve housing. Install one more PWA 85465 Rigging Pin (Ref. Fig. 504, 505) (Sheet 4/4).

(8) Install the forward adjuster rod end (5) with the bolt (2), lubricated with Material No.P03-001, bushing (4), and nut (6). TORQUE the nut to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN) (Ref. Fig. 504, 505) (Sheet 2/4).
NOTE : Be sure and install the bolt (2) from the inside and the bushing (4) between the idler arm (11) and the adjuster rod end (5).

(9) Pull the cable rod end (9) rearward (Ref. Fig. 504, 505) (Sheet 4/4). See if the rear adjuster rod end (5) and the LPT valve lever arm (14) bolthole align.

(10) If the bolthole aligns, install the bolt (2) (from the inside) and attach the rod end (5).
Lubricate the bolt threads with Material No.P03-001 and install the nut (6). TORQUE the nut to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN). Tighten and TORQUE the jamnuts to between 14 and 16 lbf.in. (0.16 and 0.18 m.daN). Wirelock.

(11) If the bolthole does not align, remove the lockwire or safety cable

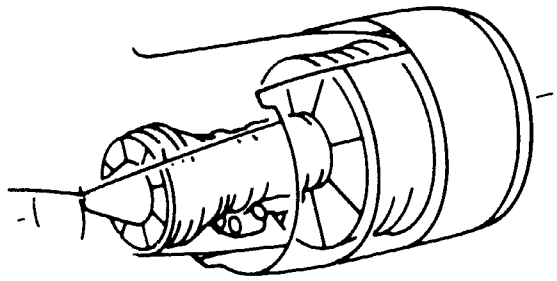
and loosen the two adjuster jamnuts (8) (Ref. Fig. 504, 505) (Sheet 4/4).
Turn the adjuster (7) and align the rod end (5) with the LPT valve lever arm (14) bolthole. Make sure that rod end threads are seen through both sight holes in the adjuster. Install the bolt (2), lubricated with Material No.P03-001, and nut (6) and attach the rod end (5). TORQUE the nut to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN). Tighten and TORQUE the jamnuts (8) to between 14 and 16 lbf.in. (0.15 and 0.18 m.daN). Install the lockwire (Material No.P05-289) or safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the jamnuts.

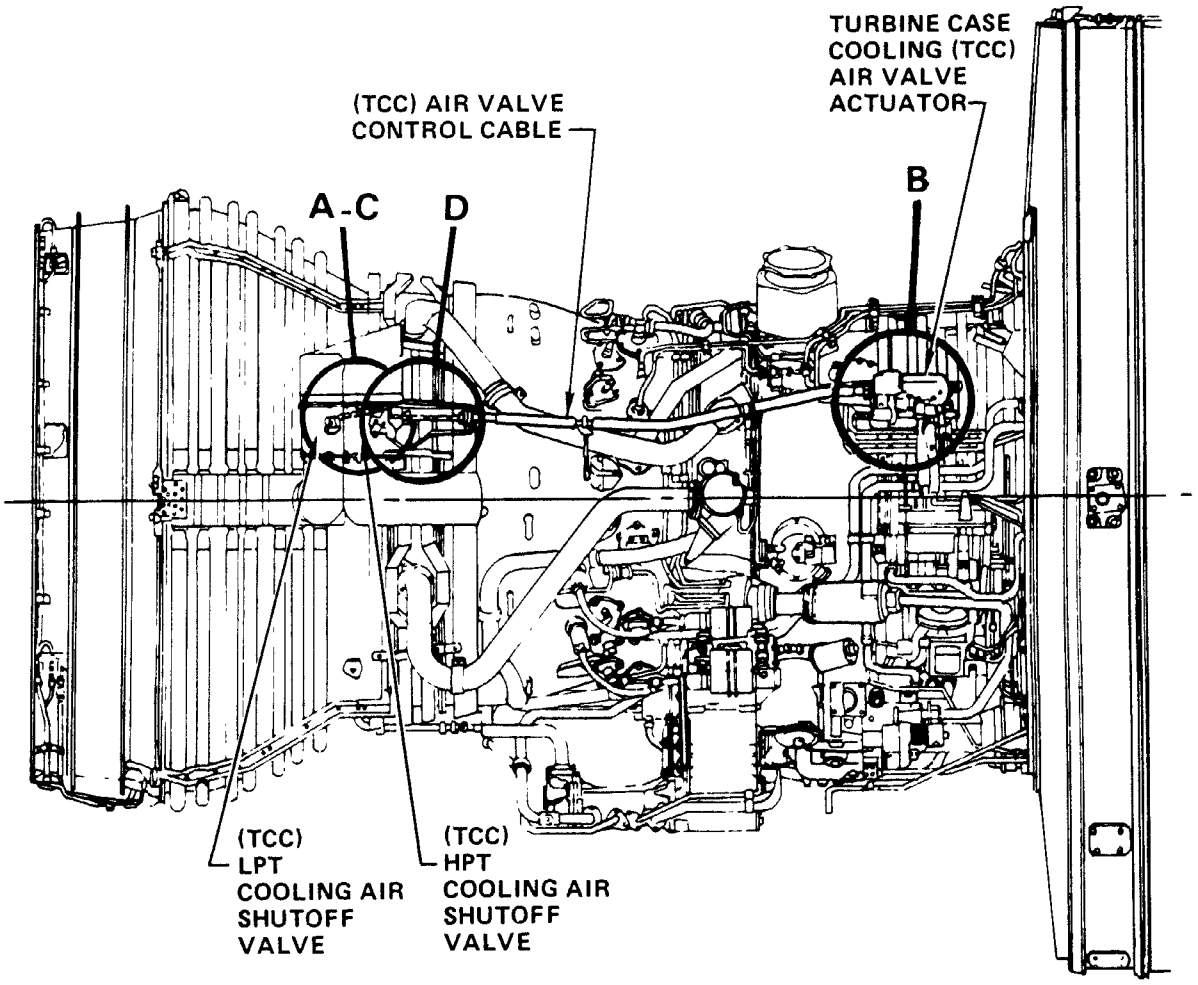
(12) Remove all three rigging pins. After the removal of the rigging pins, remove the positioning bolt from the rear of the actuator (12).
CAUTION : BE SURE THE THREE RIGGING PINS AND THE PUSHER (OR THE POSITIONING BOLT) ARE REMOVED FROM THE ENGINE OR DAMAGE CAN RESULT.

5. Close-Up and Test

A. Close right thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
Remove safety clips and tags and close circuit breakers.

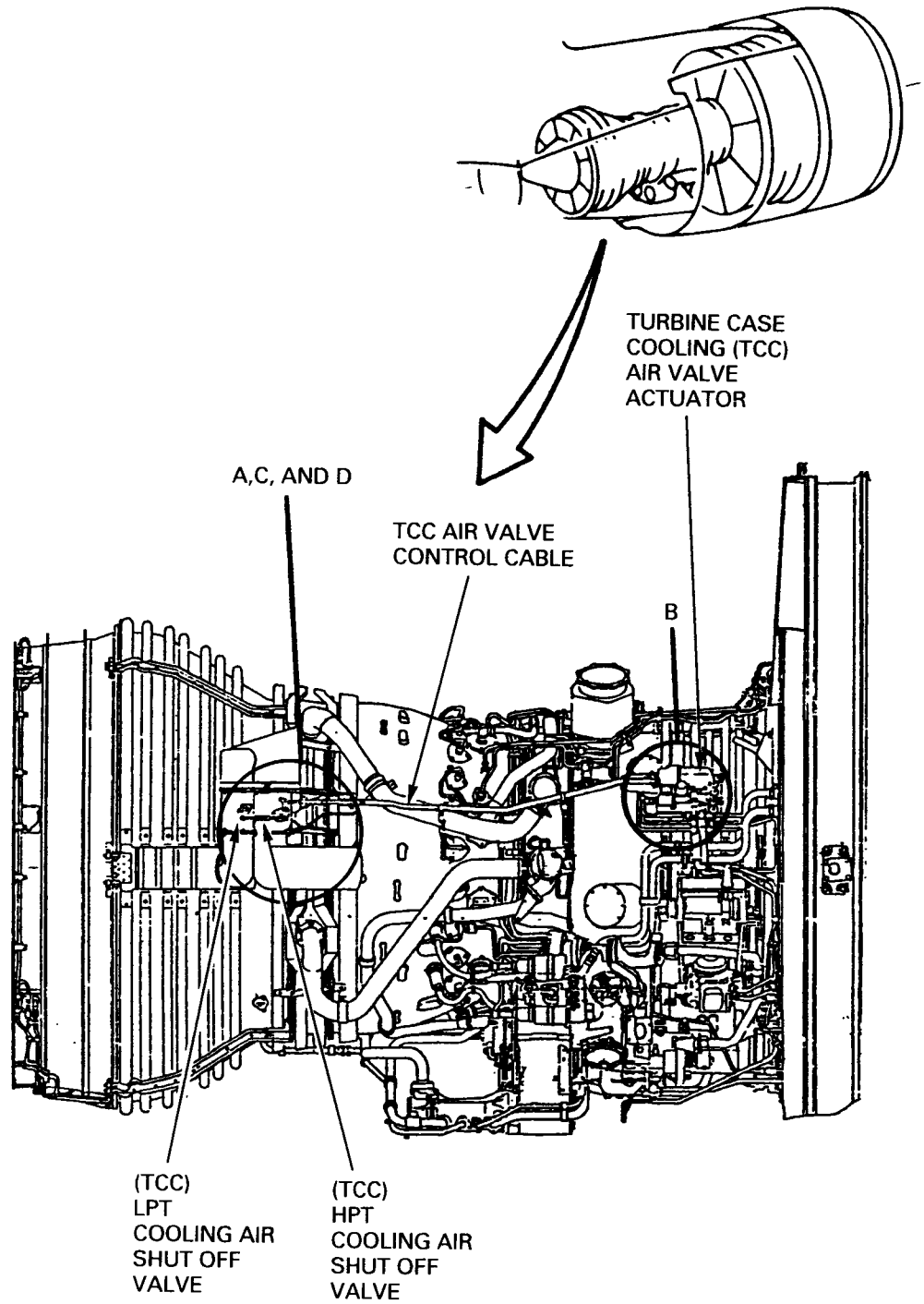
B. Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).





BM5 75 23 00 5 KBMA 00

TCC System (Sheet 1/4) (Phase 1 and
Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)
Figure 504



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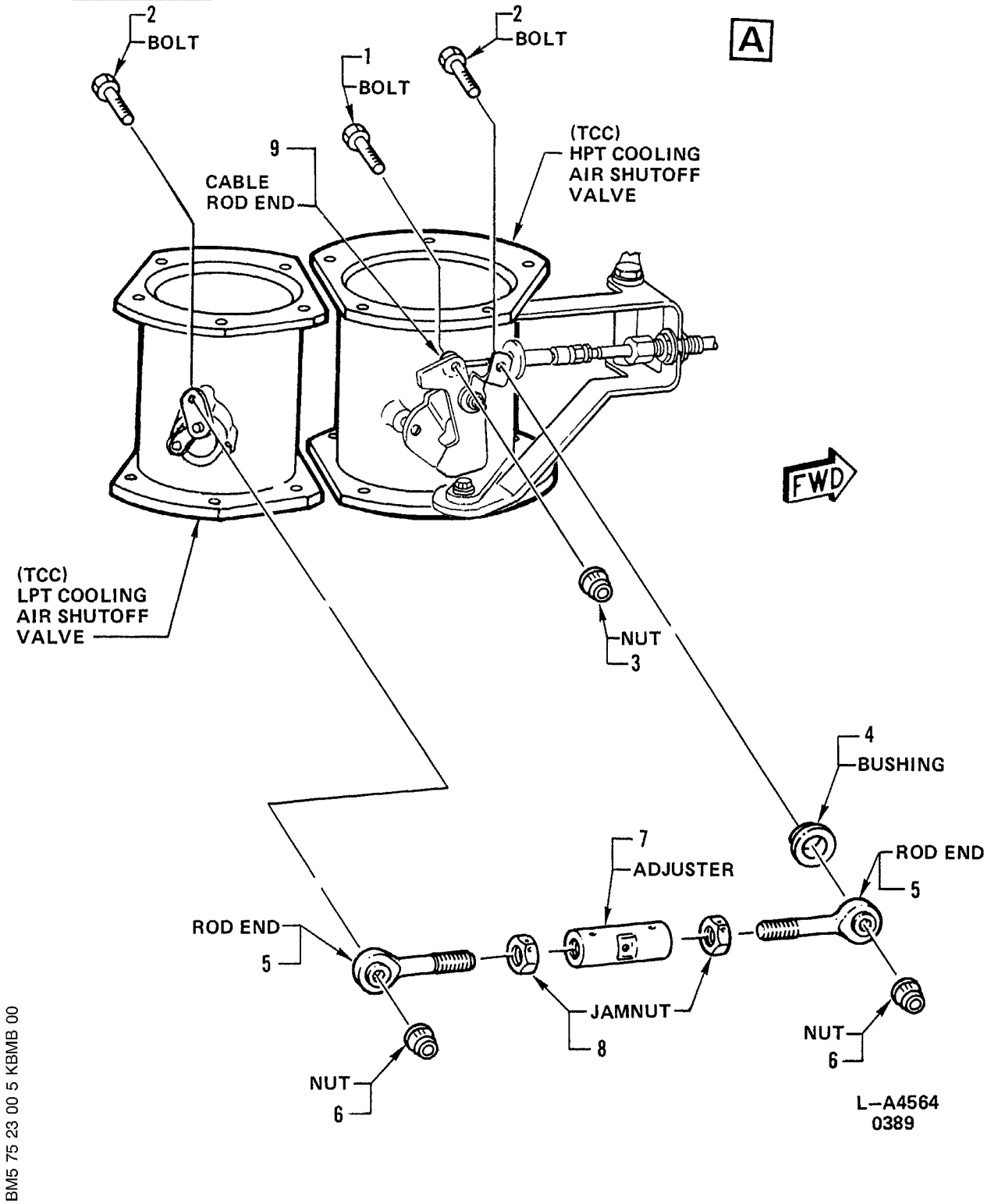
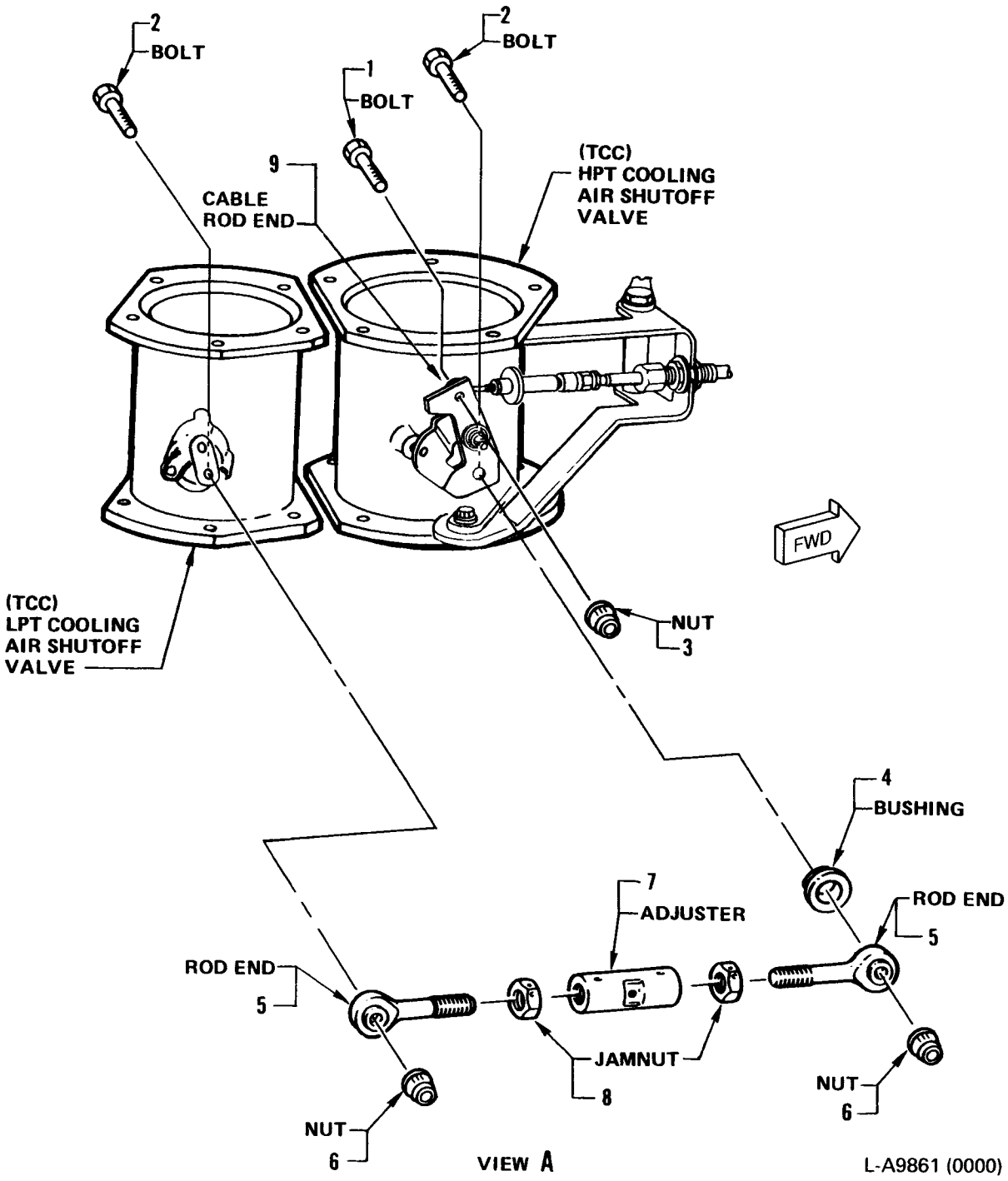
BM5 75 23 00 5 KDMA 00

TCC System (Sheet 1/4)
(Phase 3 Engines as Built by P&W)
Figure 505



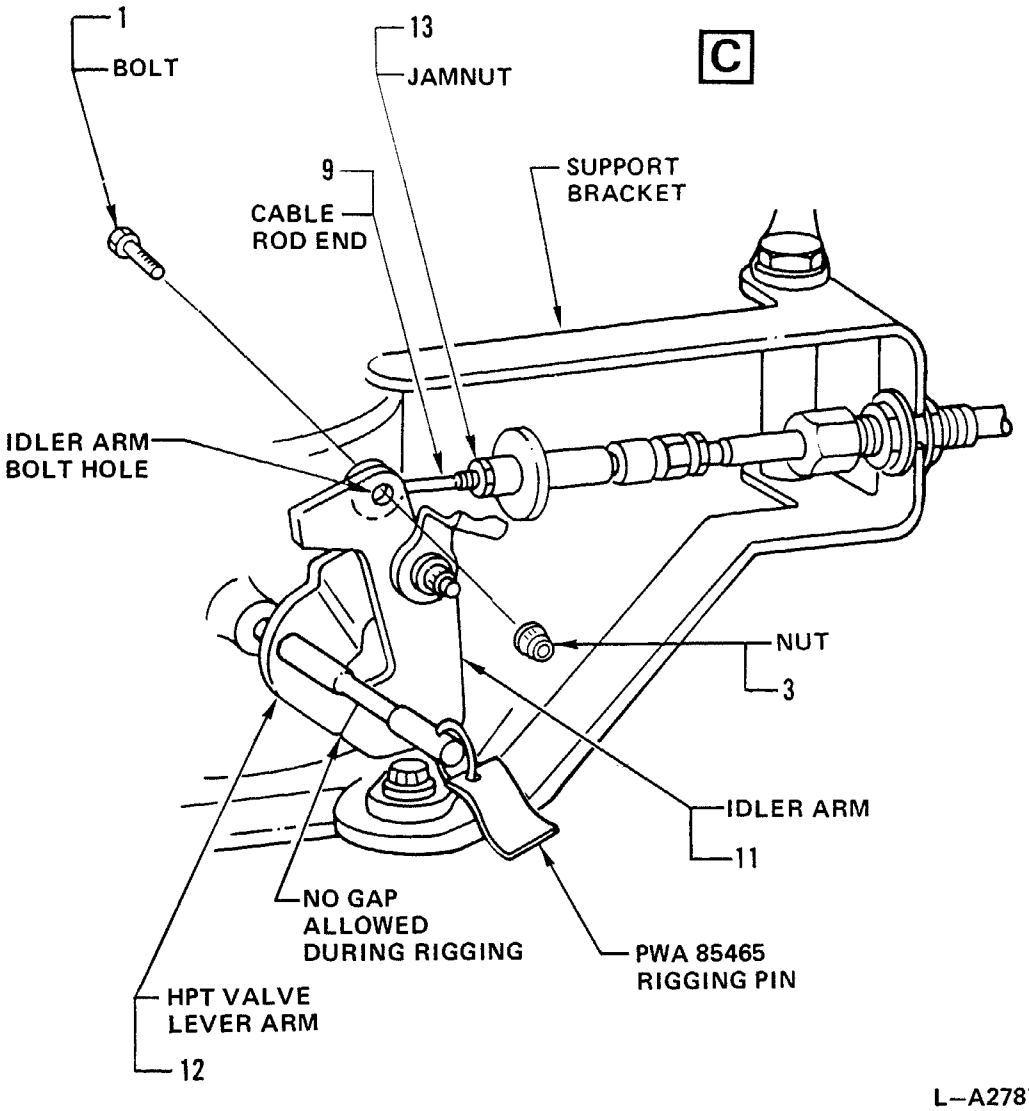
BM5 75 23 00 5 KBMB 00

TCC System (Sheet 2/4) (Phase 1 and
Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)
Figure 504



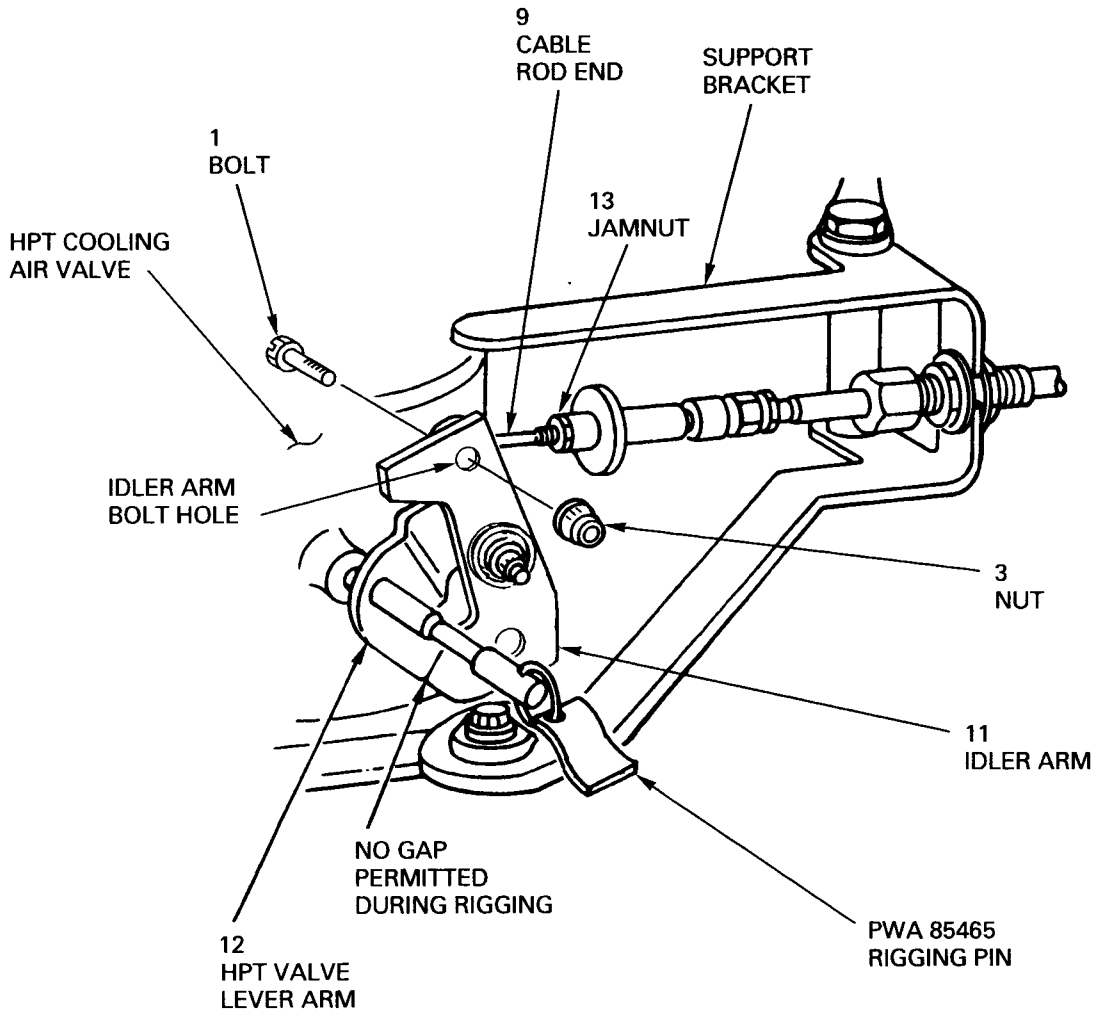
BM5 75 23 00 5 KDMF 00

TCC System (Sheet 2/4)
(Phase 3 Engines as Built by P&W)
Figure 505



BM5 75 23 00 5 KBMD 00

TCC System (Sheet 3/4) (Phase 1 and
Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)
Figure 504



VIEW C

BM5 75 23 00 5 KDMM 00

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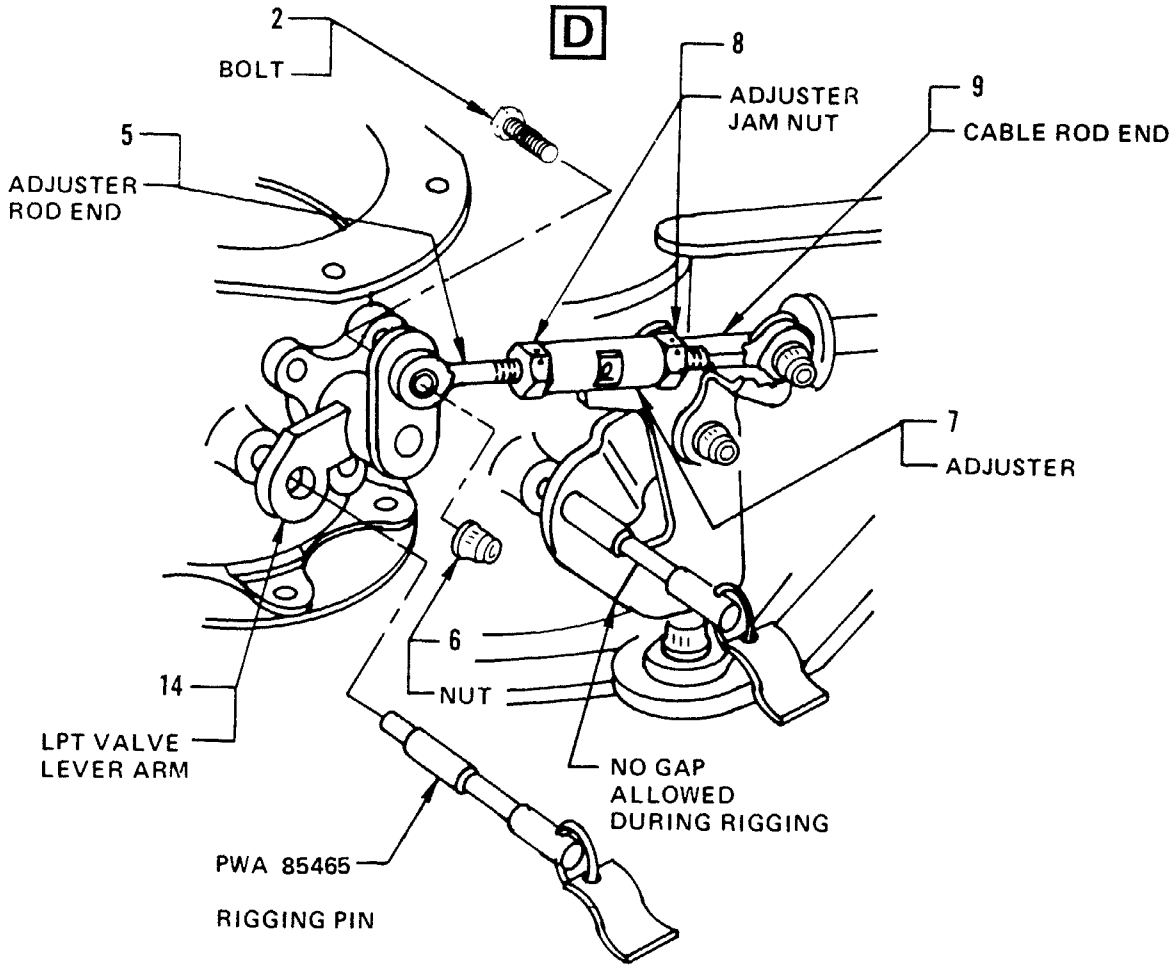
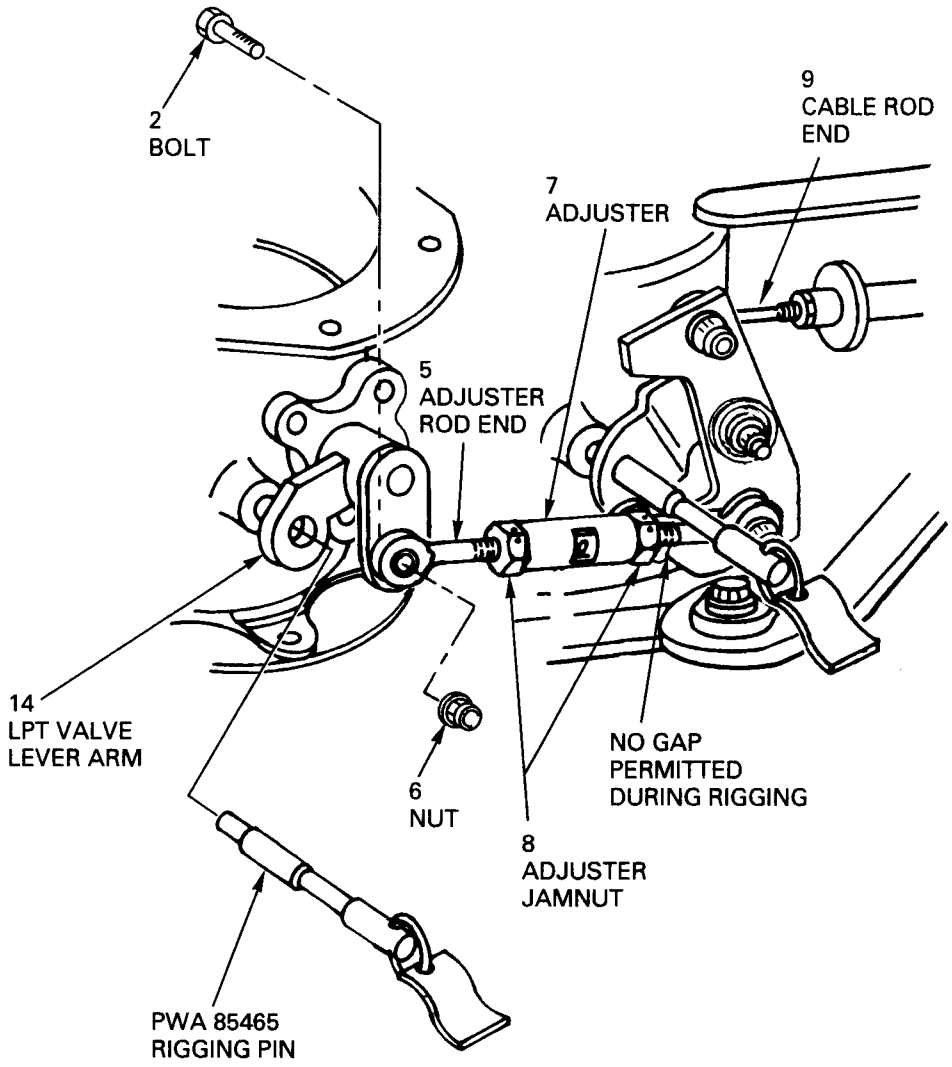
TCC System (Sheet 3/4)
(Phase 3 Engines as Built by P&W)
Figure 505



L–A5395

BM5 75 23 00 5 KBME 00

TCC System (Sheet 4/4) (Phase 1 and
Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)
Figure 504



VIEW D

L-A9863 (0498)

BM5 75 23 00 5 KDMU 00

TCC System (Sheet 4/4)
(Phase 3 Engines as Built by P&W)
Figure 505

AUTOMATIC TURBINE ROTOR CLEARANCE CONTROL SYSTEM (ATRCCS) - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clip
B.	Access Platform
C. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-23-00, P. Block 501	Automatic Turbine Rotor Clearance Control System (ATRCCS)
- 75-23-02, P. Block 401	Turbine Case Cooling (TCC) Air Shutoff Valve HPT
- 75-23-04, P. Block 401	Turbine Case Cooling (TCC) Air Shutoff Valve LPT
- 75-23-05, P. Block 401	Turbine Case Cooling (TCC) Air Valve Actuator
- 75-23-11, P. Block 401	Turbine Case Cooling (TCC) Air Valve Control Cable

2. Inspect the Turbine Case Cooling (TCC) System

A. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Turbine Case Cooling (TCC) Valve Open/Closed Position Check Procedure
(1)Manually turn the HPT and LPT valve lever arms clockwise till the rigging holes in the arms are aligned, which will indicate that the full open position has been achieved (Ref. Fig. 601) (Sheet 1/2).
(2)Release the lever arms to allow the valve to close. Full closure can be visually observed when the stop tab on the LPT case cooling valve arm contacts the lever. (Ref. Fig. 601) (Sheet 2/2)

C. Inspect Turbine Case Cooling (TCC) System Manifolds and Tubes
(1)Visually inspect the TCC system manifolds and tubes (See Table 601). (Ref. Fig. 602)

ITEM	INSPECT FOR	CONTINUE IN SERVICE LIMITS
TCC System Tubes and Manifolds	Cracks	Up to 180 degrees circumferentially or 6 in. (152.4 mm) axially if the crack is stop drilled and does not

ITEM	INSPECT FOR	CONTINUE IN SERVICE LIMITS
		permit air to blow on the case or flange. Up to 2 cracks per tube or collector. If tubes are found cracked, the TCC system tubes must be inspected for loose and worn clamps. Loose clamps must be tightened and worn clamps must be replaced before the next flight. Cracked tubes must be replaced at the next A-check.
	Holes	Up to 0.15 in. (3.81 mm) diameter permitted if the air exiting the hole does not blow directly on the turbine case or flange. Up to 4 holes in all tubes connected to the collector and the collector. Up to 4 holes for each tube or collector is permitted if the total area is not more than 0.071 in. (46 mm). Tubes with holes that are more than 0.15 in. (3.81 mm) must be replaced at the next A-check.
	Corrosion and Stains	Permitted without restriction.
	Loose Tube Nuts	None permitted
	Loose or Broken Lockwire	None permitted
	Nicks, Scratches, Chafing and Pitting	Nicks, scratches, chafing and pitting is permitted with no limit until air leakage occurs. If there is air leakage, treat it as a hole.

ITEM	INSPECT FOR	CONTINUE IN SERVICE LIMITS
	Dents	Dents are permitted with no limit as long the tubing OD is not decreased by more than 20 percent at each location. Tubes dented more than 20 percent must be replaced at the next A-check.

Inspection reference
Continue in Service Limits For the TCC
System Tubes and Manifolds
Table 601

D. Inspect the Turbine Case Cooling (TCC) Manifolds and Tubes, Supports and Clamps

(1)Evidence of looseness, cracks or damage to cushion material is acceptable within limits specified below.
(Ref. Fig. 602)

NOTE : The cushion material for the turbine case cooling (TCC) manifolds and tubes are located at all support locations, 360 degrees around the low pressure turbine (LPT) and high pressure turbine (HPT) cases.

(a)Looseness of supports or clamps attached to the manifolds is not acceptable and must be corrected.

(b)Inspect supports and clamps for cracks. None are acceptable.

(c)Inspect clamps for damage to cushion material.
Any extent is acceptable unless looseness or chafing occur.

E. Inspect the Turbine Case Cooling (TCC) Control System and Linkage
(Ref. Fig. 603)

NOTE : Use this check to :
- do a general inspection when a damaged or defective component is not suspected
- do a general inspection without any disassembly.

Also see the check in Paragraph D. when you suspect improper operation of the system.

(1)Examine the clamps that attach the actuator to the bracket for looseness, wear, and cracks. Replace the clamps if necessary.

(2)Examine the clamps that attach the control cable to the brackets for looseness, wear, and cracks. Replace the clamps if necessary.

(3)Examine the cable rod end and the adjuster rod ends for wear. If you find any worn rod end, replace the rod end and adjust the system (Ref. 75-23-00, P. Block 501).

(4)Examine the cable rod end and the adjuster rod ends and be sure that they are correctly attached.
(5)Examine the air valves and be sure that the valves are in the full closed (shut down) position.

F. Inspect Turbine Case Cooling (TCC) System Linkage
(Ref. Fig. 603)
NOTE : Use this check to :
- be sure that the linkage and valves work freely
- find any secondary damage caused by a known defective component
- find the cause of damage to a component
- when you suspect improper operation of the system.

Use the check in Paragraph F. to :
- do a general inspection when a damaged or defective component is not suspected
- do a general inspection without any disassembly.

(1)Remove the bolt and nut that attach the cable rod end to the idler arm.
(2)Manually, pull the cable rod end rearward. If the cable rod end separates from the cable, the shear pin is defective. If necessary, replace the cable (Ref. 75-23-11, P. Block 401).
(3)Remove the two bolts, nuts, and front bushing that attach the adjuster to the valve lever arms.
(4)Examine the adjuster rod end bearings for wear and if the bearings turn freely in the rod ends.
If necessary, replace the adjuster rod ends as follows.
(a)Remove lockwire and loosen the applicable jam nut. Replace the rod end and jam nut.
(b)Adjust and rig the system (Ref. 75-23-00, P. Block 501).
(5)Examine the idler arm for wear and see if it turns freely on the valve shaft. If not, replace the idler arm or bearing as follows.
(a)Remove the nut that attaches the idler arm with the bearing and retaining ring. Remove the arm. If equipped with a spacer, replace the nut on the shaft and tighten by hand.
(b)Remove the retaining ring and bearing from the idler arm.
(c)Replace the defective part and install the bearing to the arm. Install the retaining ring.
(d)Remove the nut from the shaft. Install the arm and, if equipped (PRE SB PW4ENG 75-74) the spacer in position. Install the nut, lubricated with Material No.P03-001. TORQUE the nut to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN). Adjust and rig the system, (Ref. 75-23-00, P. Block 501).
(6)Manually turn the HPT and LPT valve lever arms clockwise to the full open position. Release the lever arms and be sure the valves go back to full closed position. If a lever arm does not go back or does not turn freely, replace the defective valve (Ref. 75-23-02, P. Block 401) or (Ref. 75-23-04, P. Block 401) as applicable.
(7)If the control cable or the actuator are suspected of seizure, do as follows.
(a)Remove the actuator (Ref. 75-23-05, P. Block 401).
(b)Use a soft drift and manually push the piston shaft into the actuator. If the shaft does not move freely or does not come back,

replace the actuator (Ref. 75-23-05, P. Block 401).

(c)Manually push and pull the control cable for the full travel. If the cable does not move freely, replace the cable (Ref. 75-23-11, P. Block 401).

(8)If the adjustment of the system is suspected of being off, check the rigging (Ref. 75-23-00, P. Block 501).

(9)Install the adjuster assembly as follows.

(a)Install the bushing (flange outward) to the outside of the idler arm bolt hole.

(b)Position the adjuster assembly to the value lever arm and the idler arm.

(c)Attach the adjuster assembly with two bolts, lubricated with Material No.P03-001 and nuts. TORQUE the nuts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

NOTE : Install the bolt from the inside of the arms.

(10)Attach the cable rod end to the inside of the idler arm with the bolt, lubricated with Material No.P03-001. Install the nut and TORQUE it to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN)

NOTE : Install the bolt from the inside of the rod end.

G. Visually examine inside the cooling air (TCC) air inlet duct for the removal of the blank-off plate and the proper use of the metering plate as follows.

(1)Be sure that the TCC blank-off plate (PN53T473) between the upper support bracket and the TCC cooling air inlet duct is removed.

(2)(Pre SB PW4 ENG. 73-53) Be sure that the TCC metering plate (PN53T542), between the upper support bracket and the TCC cooling air inlet duct is installed.

(3)(Post SB PW4 ENG. 73-53) Be sure that the TCC metering plate (PN53T542), between the upper support bracket and the TCC cooling air inlet duct is removed.

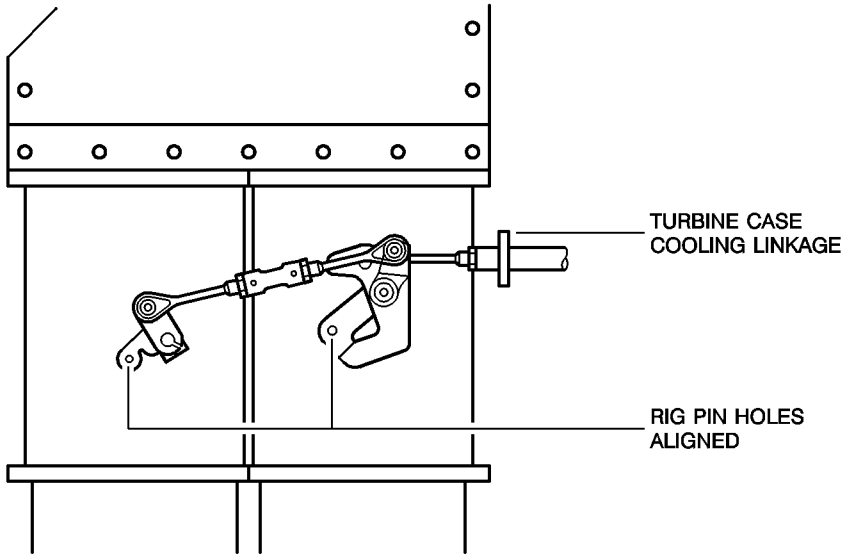
H. Examine electrical harnesses for signs of rub, wear, and/or loose connectors. Replace as required.

R

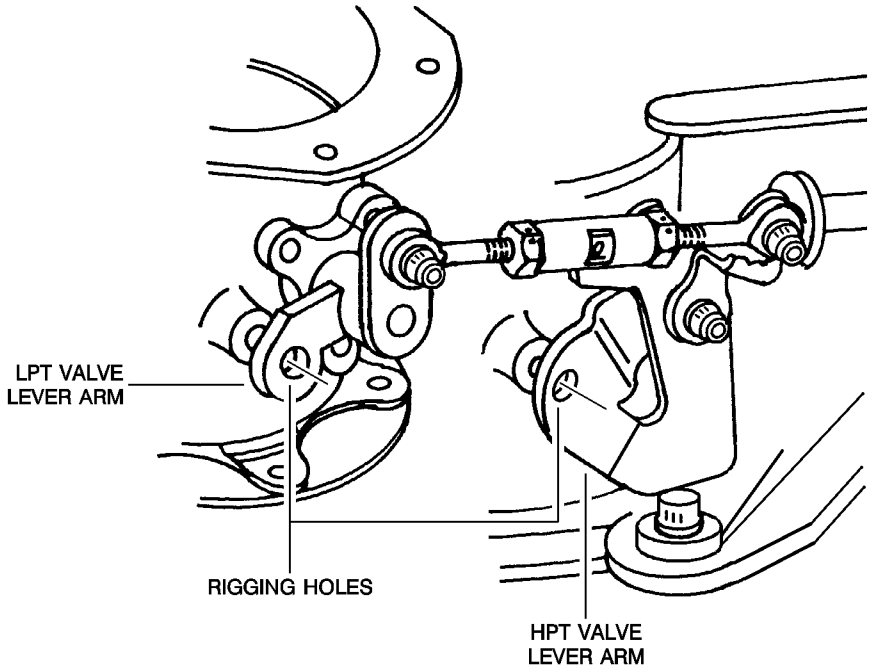
J. Close-Up

(1)Remove access platform.

(2)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

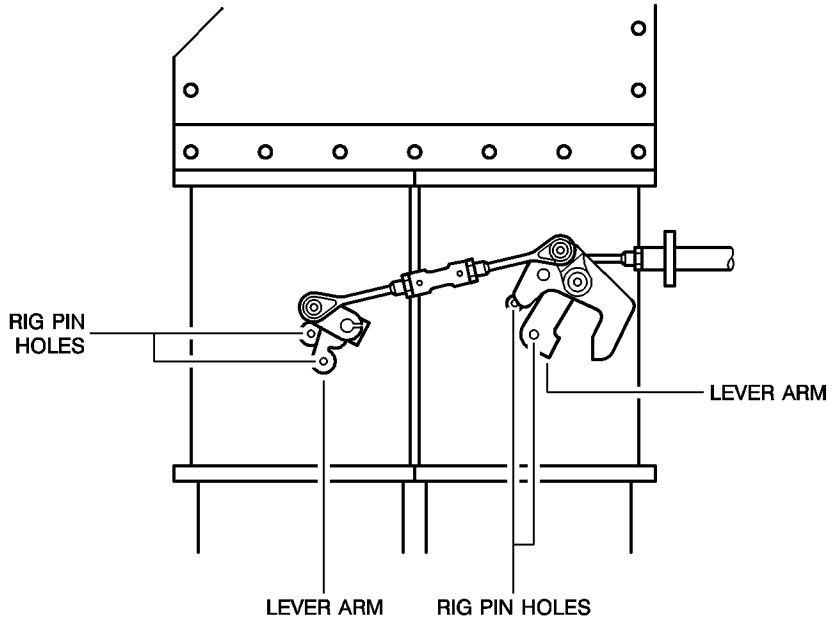


AIR SHUTOFF VALVES
FULLY OPEN POSITION

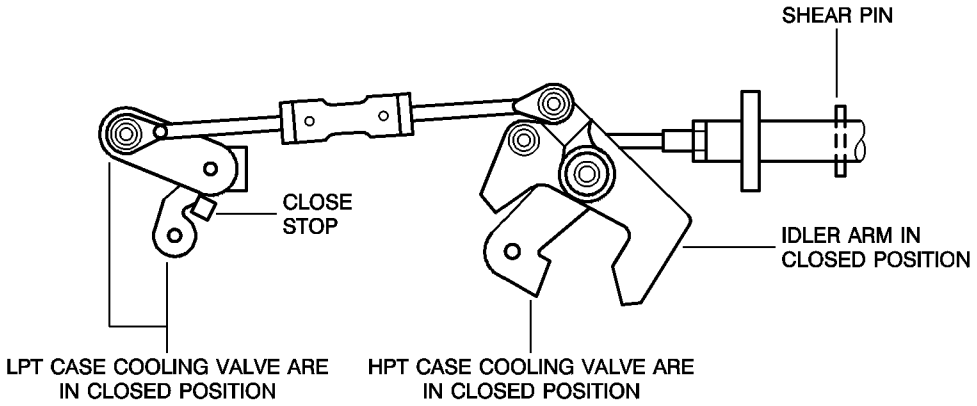


BM5 75 23 00 6 KHMA 00

TCC Valve Open/Closed Position Check (Sheet 1/2)
Figure 601

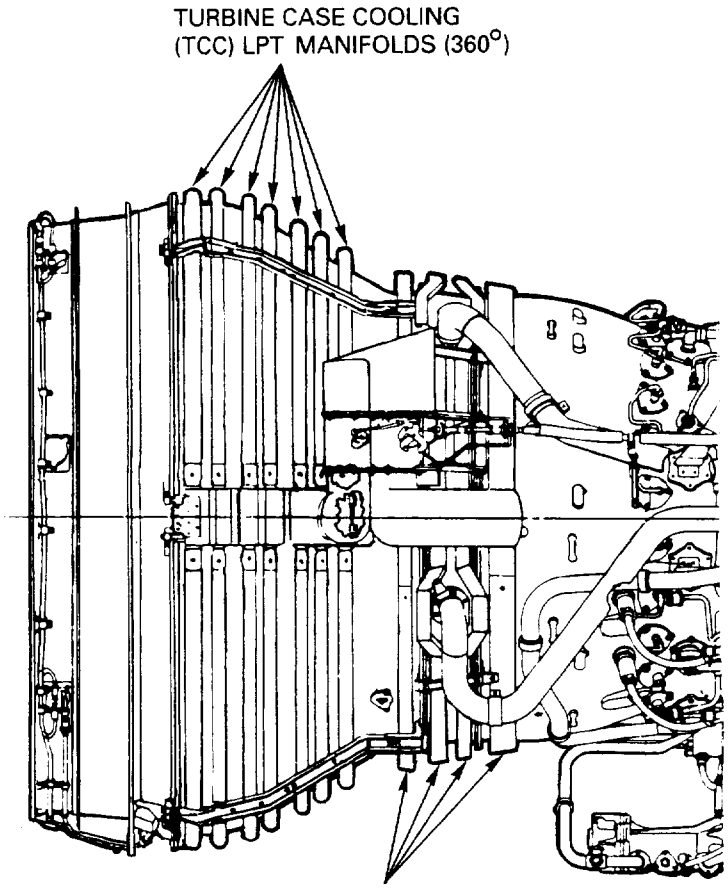


AIR SHUTOFF VALVES
FULLY CLOSED POSITION
(SHUT DOWN)



BM5 75 23 00 6 KHMJ 00

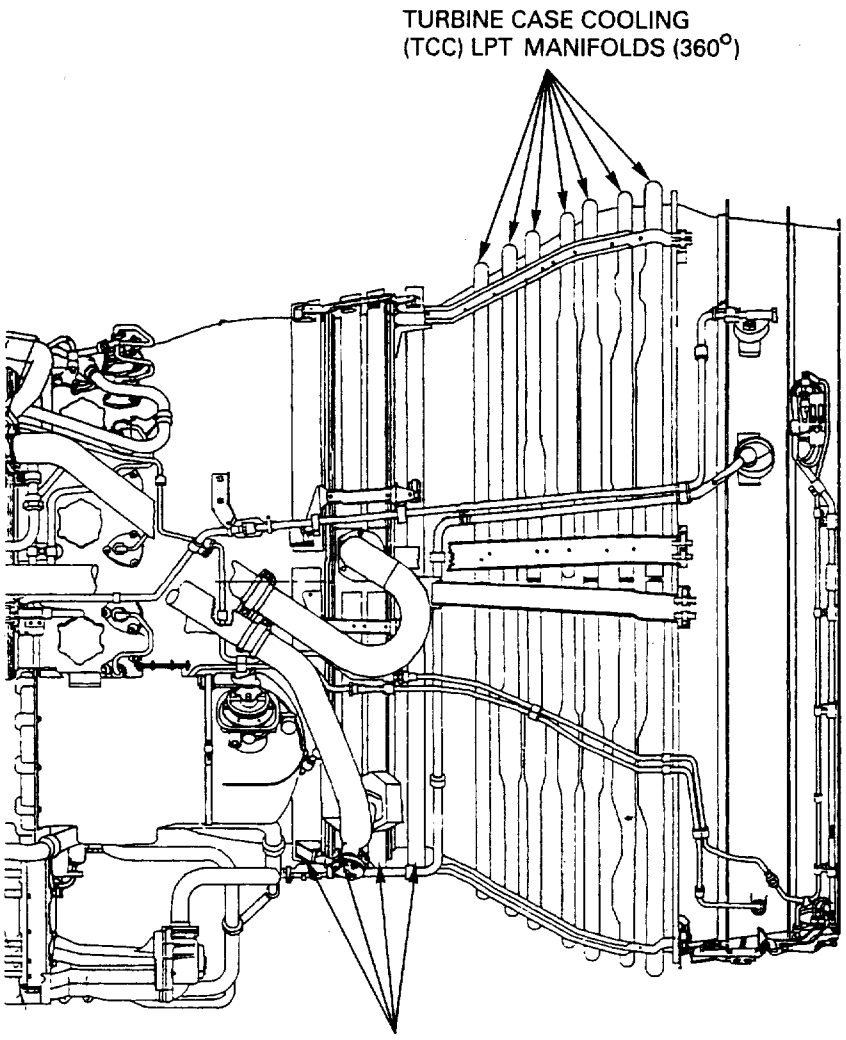
TCC Valve Open/Closed Position Check (Sheet 2/2)
Figure 601



L-B7784 (1299)

BM5 75 23 00 6 KCMA 00

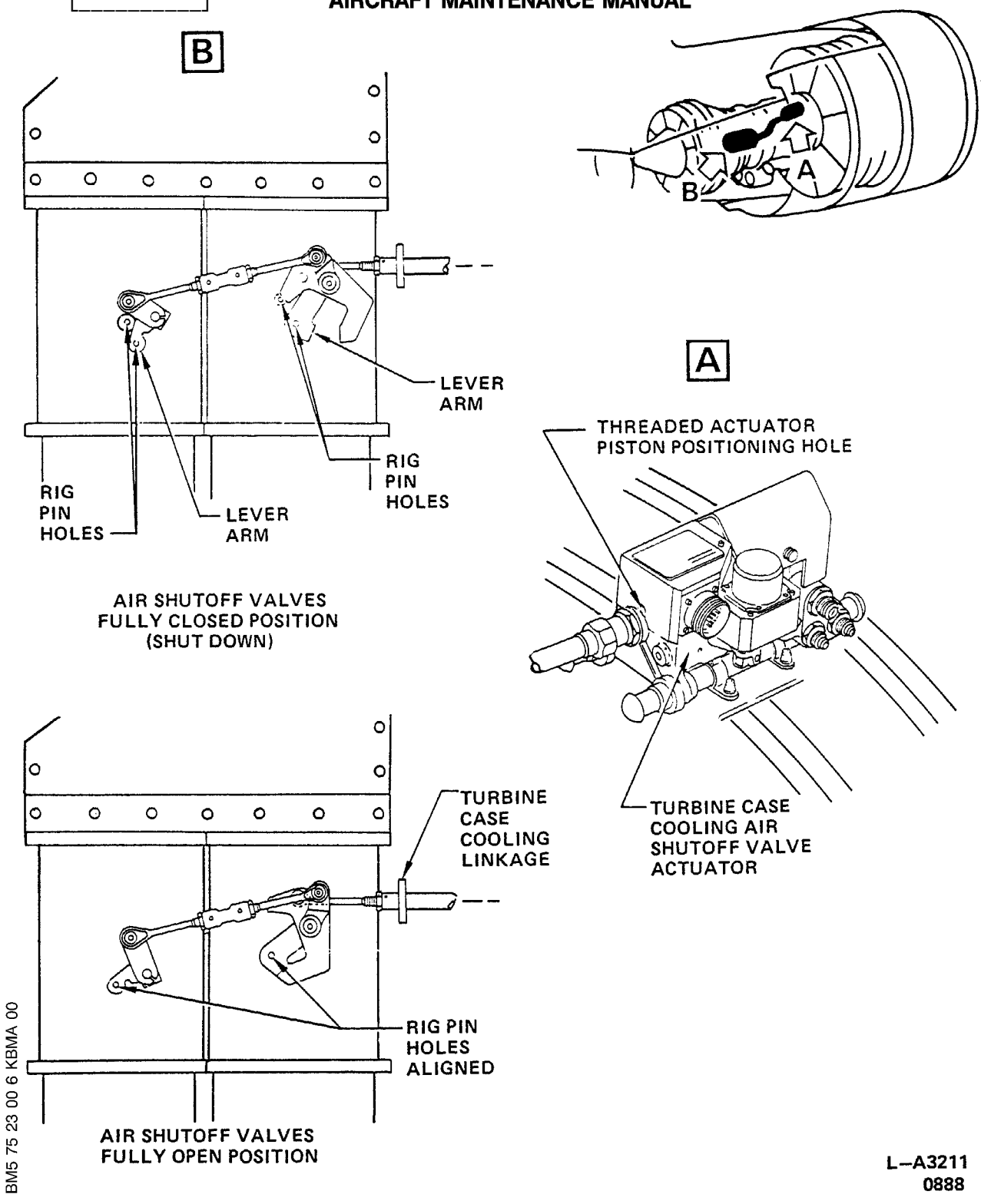
Turbine Case Cooling (TCC) Manifolds and Tubes (Sheet 1/2)
Figure 602



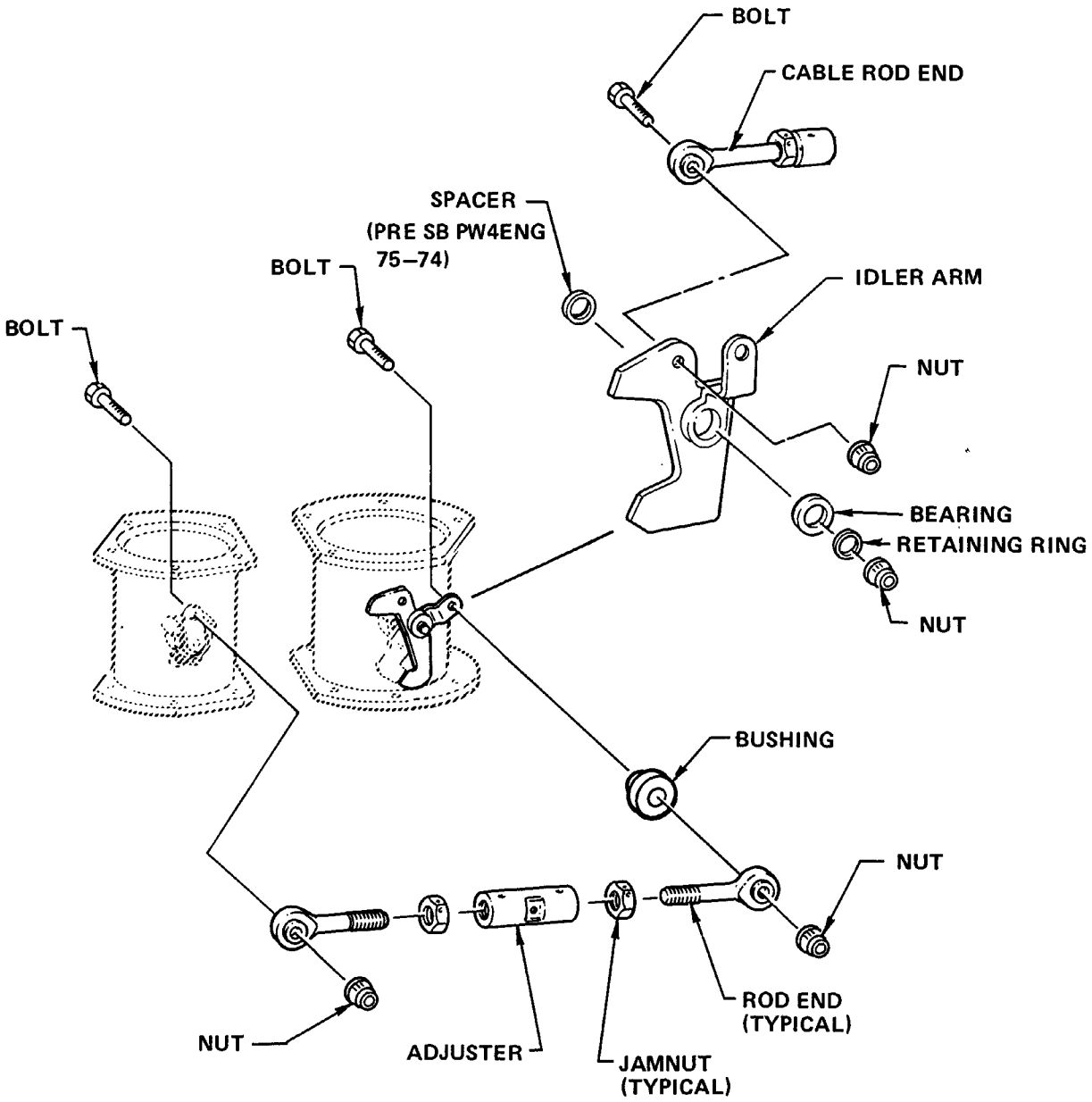
BM5 75 23 00 6 KCMJ 00

L-B7785 (1299)

Turbine Case Cooling (TCC) Manifolds and Tubes (Sheet 2/2)
Figure 602



TCC System Linkage Inspection (Sheet 1/2) (Phase 1, Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592)
Figure 603



BM5 75 23 00 6 KBMB 00

TCC System Linkage Inspection (Sheet 2/2) (Phase 1, Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592)
Figure 603

TURBINE CASE COOLING SYSTEM - DEACTIVATION/REACTIVATION

Ref. MMEL Sect. 1-75, Item 1 (TCC System)

1. Deactivation of the Turbine Case Cooling (TCC) Air Valves

A. Equipment and Materials

ITEM	DESIGNATION
A.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
B. Material No.P05-289	Special Materials (Ref. 70-00-00)
C. Material No.P05-291	Special Materials (Ref. 70-00-00)
D. Material No.P05-292	Special Materials (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install an access platform.

C. Procedure (Ref. Fig. 901, 902)
(1)Find the TCC air valves attached under the cooling collector at approximately the 3 o'clock position.
(2)Remove the nut (1) and bolt (4) which attach the rod end (3) to the valve lever.
(3)Remove the lockwire or safety cable from the rod end jamnut (2).
(4)Loosen the jamnut (2) and remove the rod end (3) from the TCC control cable.
NOTE : The valves have spring tension to the closed position.
(5)Temporarily attach the rod end (3) to the TCC control cable as follows :
- Install the bolt (4) and nut (1) to the rod end (3) and tighten to engage the self locking feature
- Use lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to attach the rod end jamnut (2) and the rod end (3) to the TCC control cable forward of the rear support bracket.

D. Close-Up
(1)Remove access platform.
(2)Close right thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)Display a warning notice in flight compartment indicating that Turbine Case Cooling System is inoperative.

2. Reactivation of the Turbine Case Cooling (TCC) Air Valves

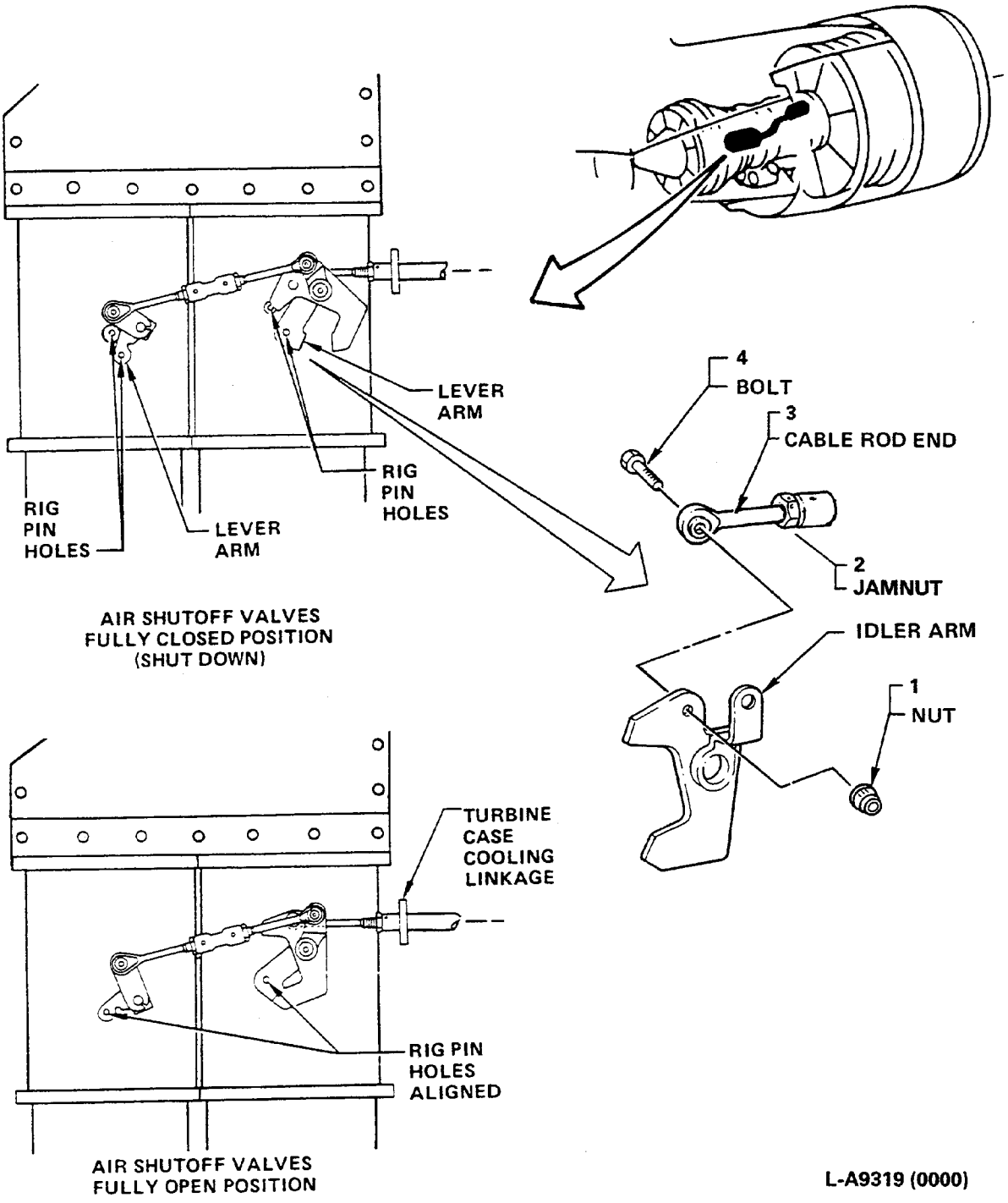
A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-23-00, P. Block 501	Turbine Case Cooling System

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install an access plafform.
(3)Troubleshoot the system and replace the applicable component to make the TCC System serviceable again.

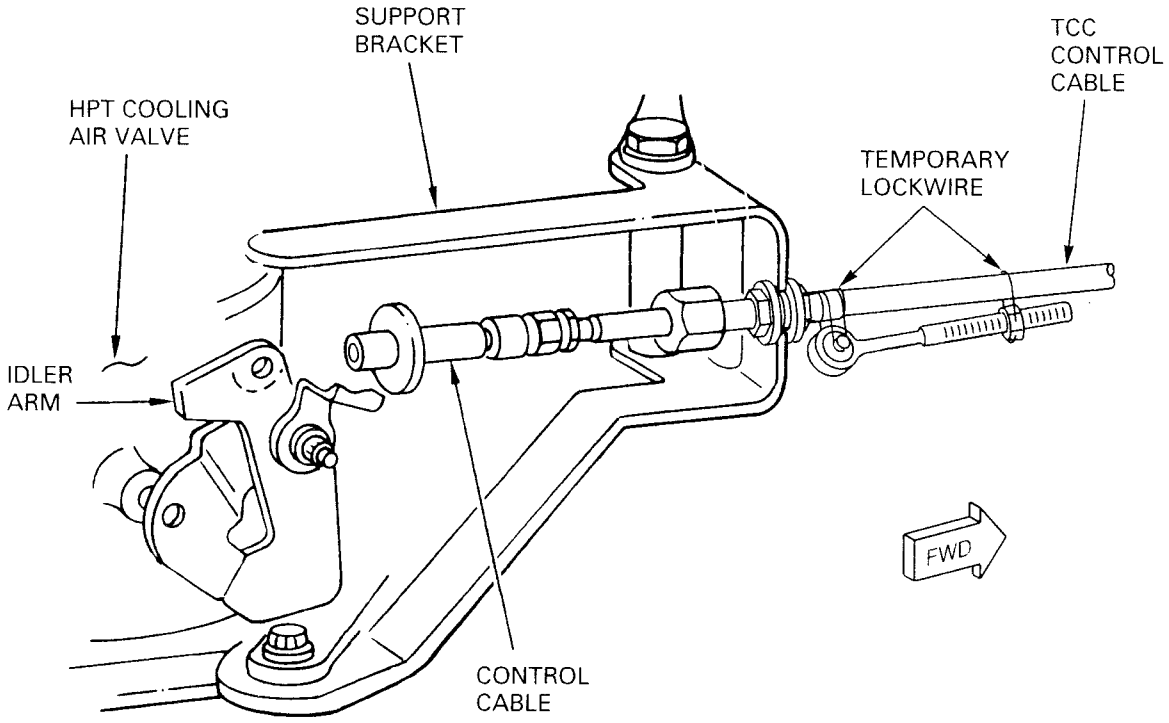
C. Procedure (Ref. Fig. 901, 902)
(1)Remove the lockwire or safety cable which temporarily attached the rod end (3) to the TCC control cable.
NOTE : You will install the rod end when you adjust the TCC system.

D. Close-Up
(1)Adjust the Turbine Case Cooling (TCC) system (Ref. 75-23-00, P. Block 501).
(2)Remove access platform.
(3)Close right thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4)Remove the warning notice in flight compartment.



BM5 75 23 00 9 KAMA 00

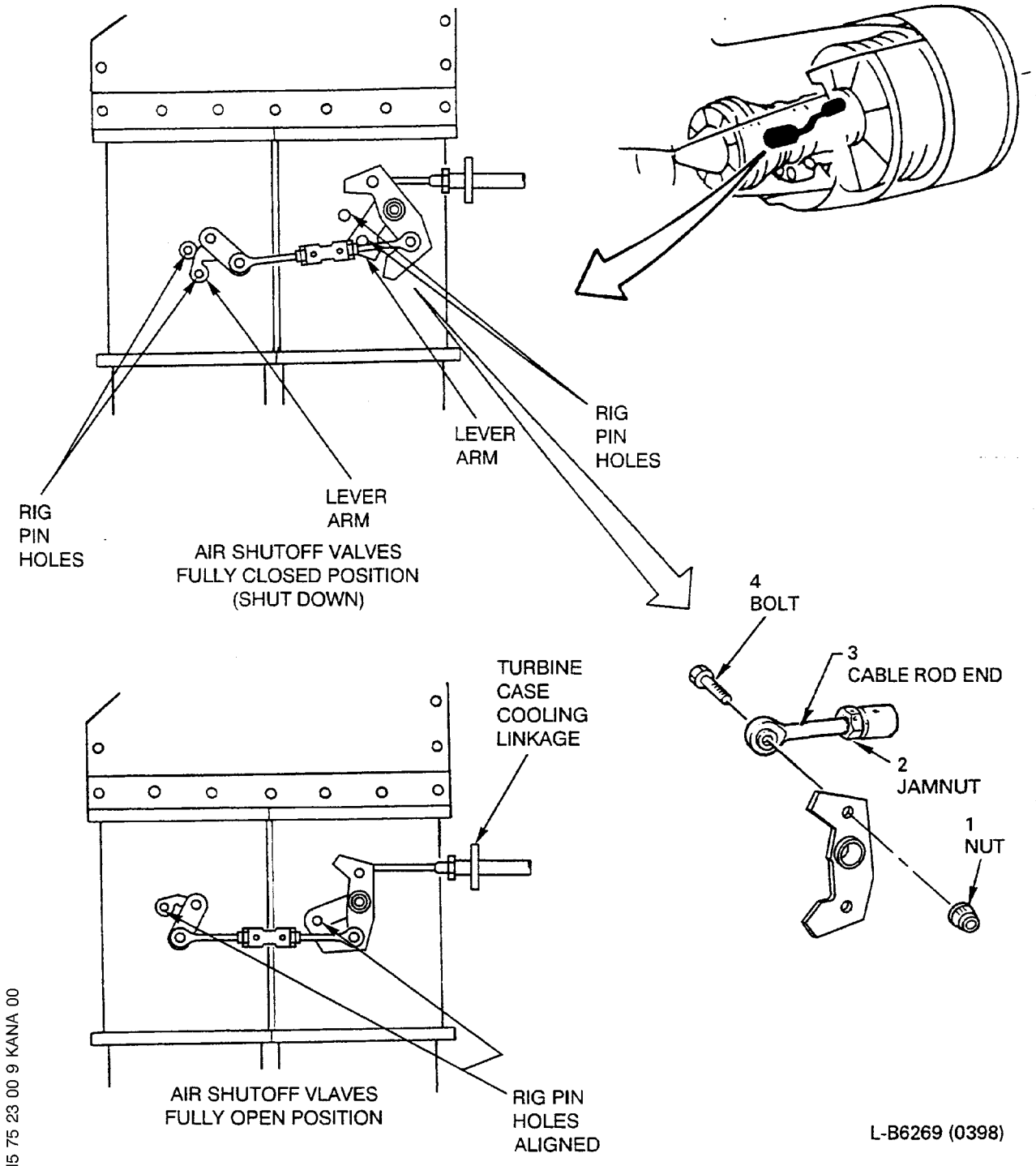
Turbine Case Cooling (TCC) HPT Air Valve (Phase 1 and Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)(Sheet 1/2)
Figure 901



L-B7786 (1299)

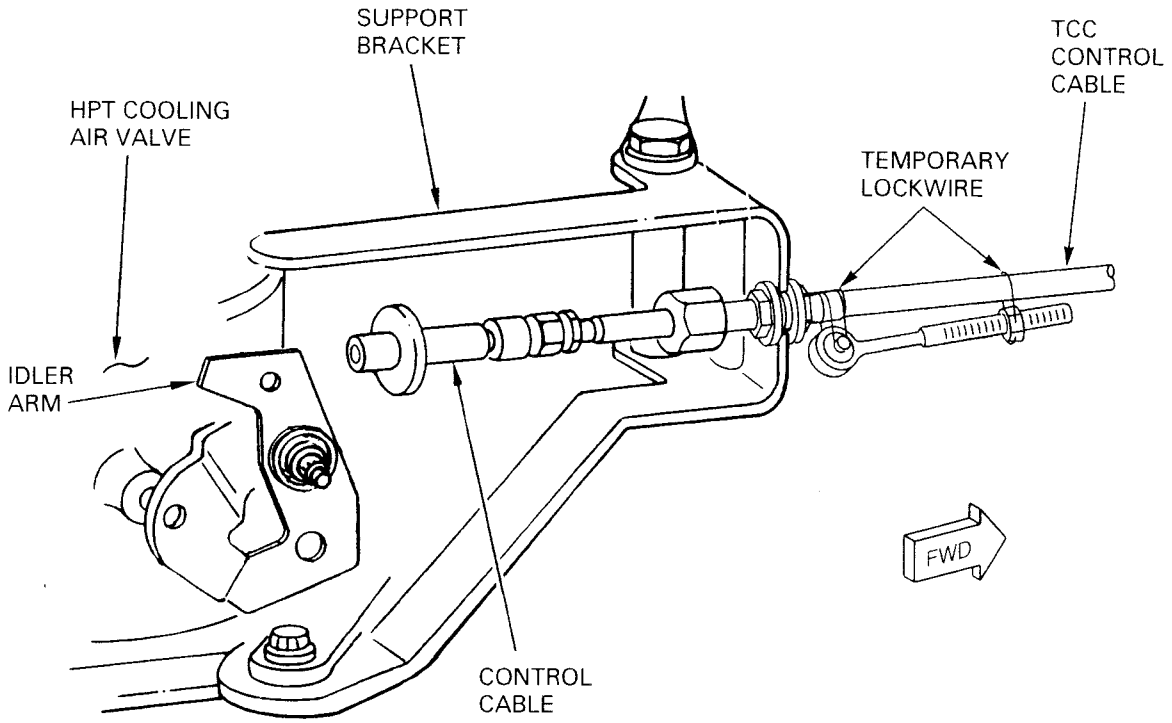
BM5 75 23 00 9 KAMJ 00

TCC HPT Air Valve Rod End Storage (Phase 1 and Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)(Sheet 2/2)
Figure 901



BM5 75 23 00 9 KANA 00

Turbine Case Cooling (TCC) HPT Air Valve
(Phase 3 Engines as Built by P&W)(Sheet 1/2)
Figure 902



L-B7787 (1299)

BM5 75 23 00 9 KANJ 00

Turbine Case Cooling (TTC) HPT Air Valve Rod End Storage
(Phase 3 Engines as Built by P&W)(Sheet 2/2)
Figure 902

TURBINE CASE COOLING (TCC) AIR SHUTOFF VALVE HPT-REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Torque Wrench
D. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 75-23-04, P. Block 401	Turbine Case Cooling (TCC) Air Valve (LPT)
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.
(3)Remove turbine case cooling (TCC) air valve (LPT) (Ref. 75-23-04, P. Block 401).

B. Removal (Ref. Fig. 401, 402)
(1)Disconnect control cable from valve idler arm interface point.
(2)Remove bolts and nuts securing upper flange of valve and support bracket to the upper support bracket.
(3)Move upper support bracket inward toward case.
(4)Remove bolts and nuts securing lower flange of valve to lower support bracket.
(5)Slide valve rearward and outward from between upper and lower support brackets.
(6)Remove bolt and nut securing turnbuckle rod end to idler arm on valve and remove rod and bushing from valve.
(7)(Pre SB PW4ENG 75-136) If valve is to be replaced, remove nut securing idler arm to valve lever and remove arm and, if equipped, a spacer from valve lever.
(8)(Post SB PW4ENG 75-136) If valve must be replaced, remove the bearing sleeve assembly that attaches the idler arm to the valve lever and remove the arm from the valve lever.

C. Installation
(1)Slide valve, with flow arrows pointing downward, into place between upper and lower support brackets while you align the bolt holes.
(2)Move upper support bracket outward into position at upper flange of the valve and attach the upper flange of the valve and support bracket with Material No. P03-001, lubricated bolts (longer bolt at support link location) to upper support bracket.
(3)Secure lower flange of valve with Material No. P03-001, lubricated bolts and nuts, to lower support bracket.
NOTE : Do not install bolt and nut at lower flange support bracket

location.
These must be installed during LPT TCC valve installlation.

(4)TORQUE all bolts securing valve flanges and braces to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(5)(Phase 1 and Post SB PW4ENG 72-572, Post SB PW4ENG 72-592 and Pre SB PW4ENG 75-136 Engines) Install the HPT (TCC) air shutoff valve idler arm to the HPT (TCC) air shutoff valve lever arm in position and, if equipped the (Pre SB PW4ENG 75-72) spacer as shown (Ref. Fig. 403).
Attach with a nut, threads lubricated with Engine Oil (Material No.P03-001). TORQUE the nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
NOTE : Do not attach cable or push-pull rod to valve at this time.
Cable and rod will be installed during cable rigging procedure.

(6)(Phase 3 Engines as built by P&W and Pre SB PW4ENG 75-136 Engines) Install the HPT (TCC) air shutoff valve idler arm to the HPT (TCC) air shutoff valve lever arm (Ref. Fig. 405). Attach with nut, threads lubricated with Engine Oil (Material No.P03-001).
TORQUE the nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
NOTE : Do not attach cable or push-pull rod to valve at this time.
Cable and rod must be installed during cable rigging procedure.

(7)(Post SB PW4ENG 75-136 Engines)
Install the HPT (TCC) air shutoff valve idler arm to the HPT (TCC) air shutoff valve lever arm (Ref. Fig. 404, 406). Attach with bearing sleeve assembly, threads lubricated with Engine Oil (Material No.P03-001). TORQUE the bearing sleeve assembly to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
NOTE : Do not attach cable or push-pull rod to valve at this time.
Cable and rod must be installed during cable rigging procedure.

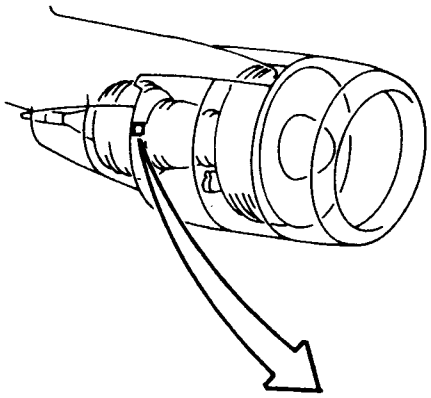
D. Close-Up and Test

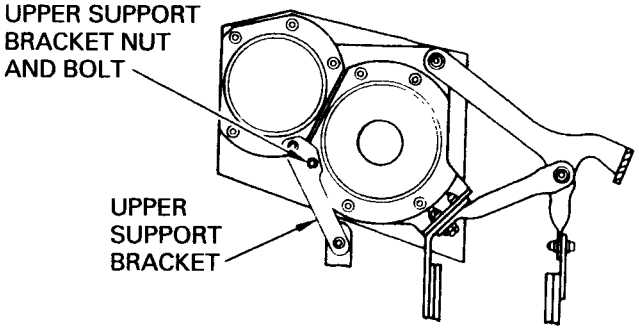
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Install turbine case cooling (TCC) air valve (LPT) (Ref. 75-23-04, P. Block 401).

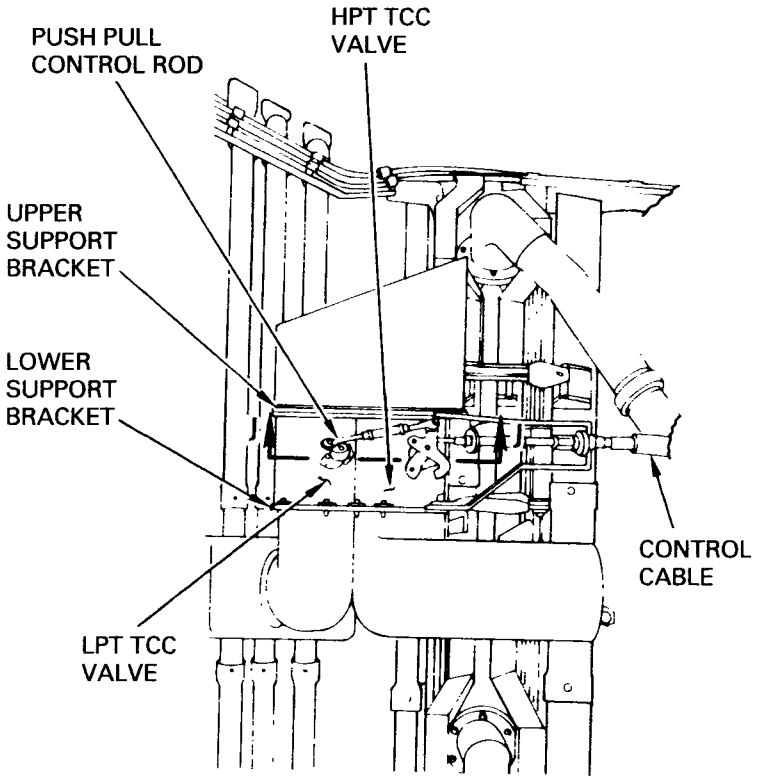
(3)Remove access platform.

(4)Close right thrust reverser and fan cowl doors and remove safety clips tags and close circuit breakers (Ref. 71-13-00, P. Block 301).





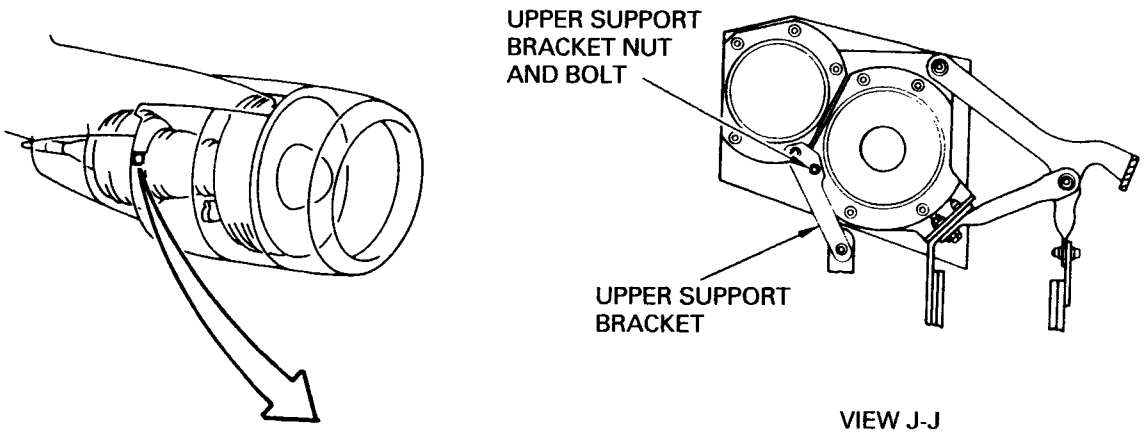
VIEW J-J

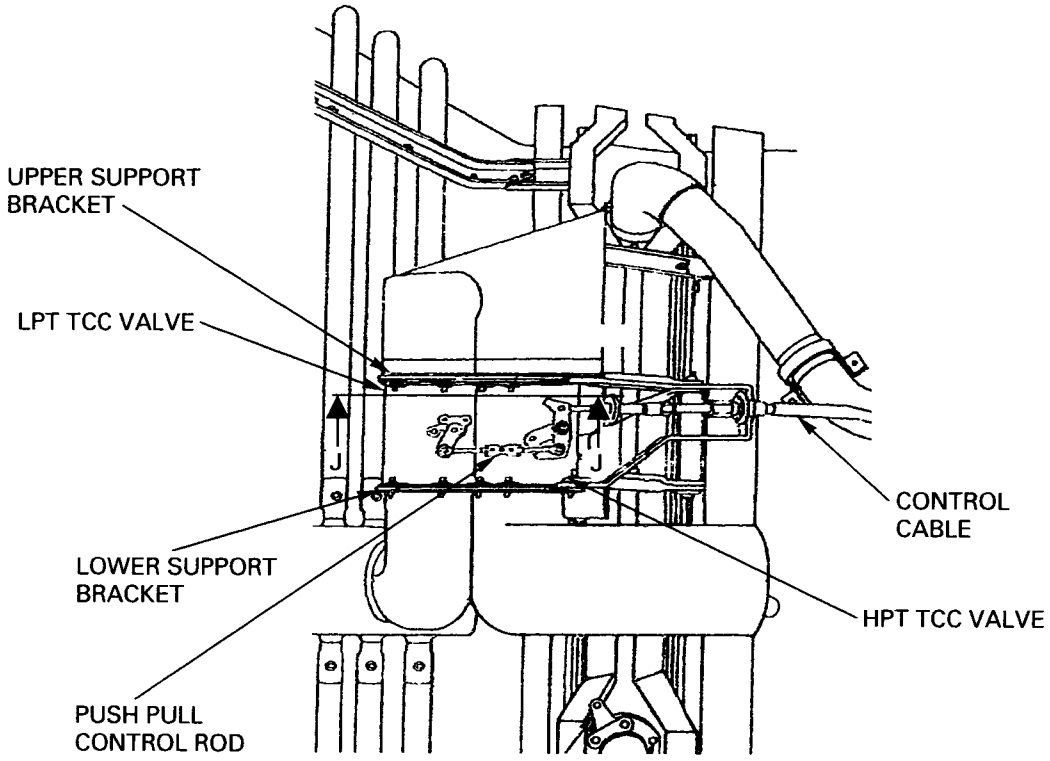


L-A0162 (1094)

BM5 75 23 02 4 KAM0 00

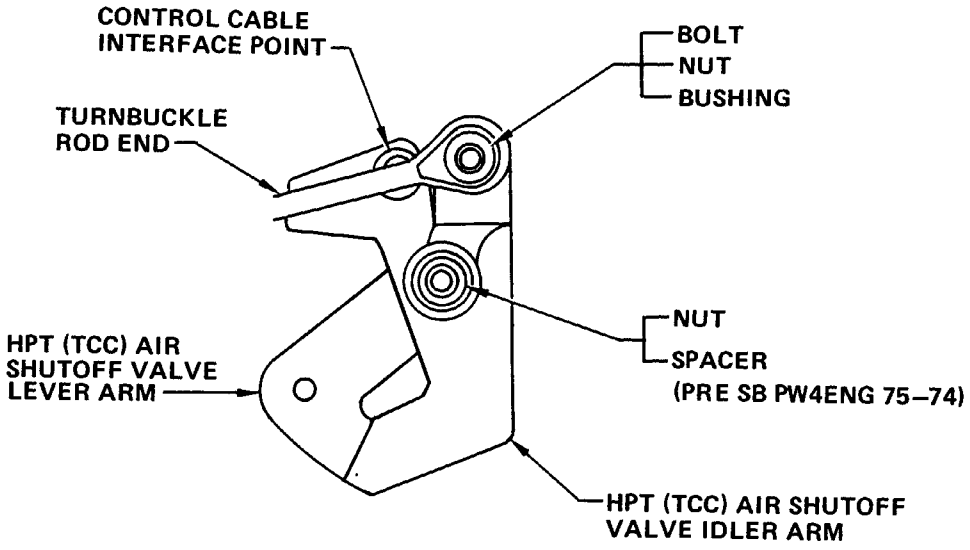
Turbine Cooling Air Valve (HPT) (Phase 1 and Post SB PW4ENG 72-572 and SB PW4ENG 72-592)
Figure 401





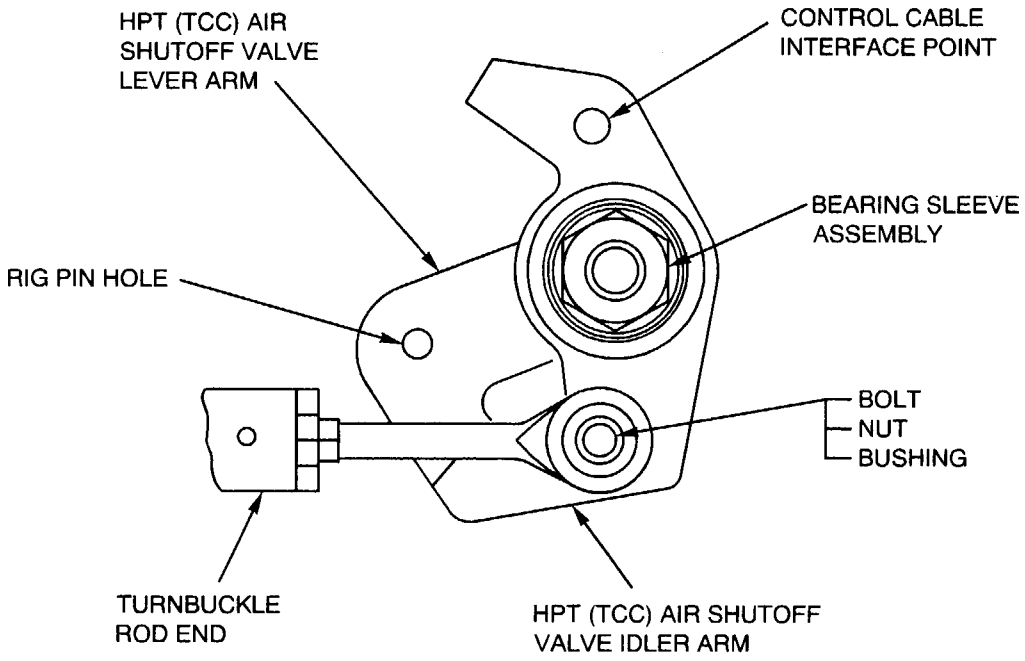
BM5 75 23 02 4 KAN0 00

Turbine Cooling Air Valve (HPT)
(Phase 3 as Built by P&W)
Figure 402



BM5 75 23 02 4 KBM0 00

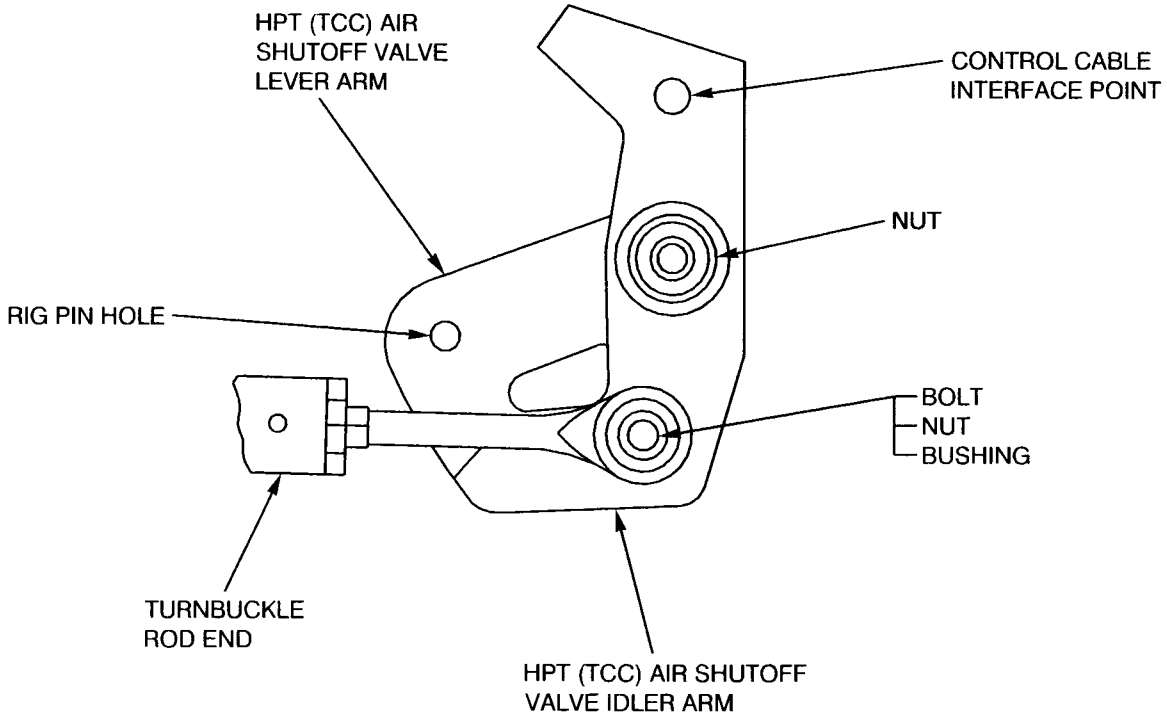
Idler Arm (Shown in Rig Position) (Phase 1 and Post SB PW4ENG 72-572, SB PW4ENG 72-592 and Pre SB PW4ENG 75-136)
Figure 403



L-B7116 (1298)
PW V

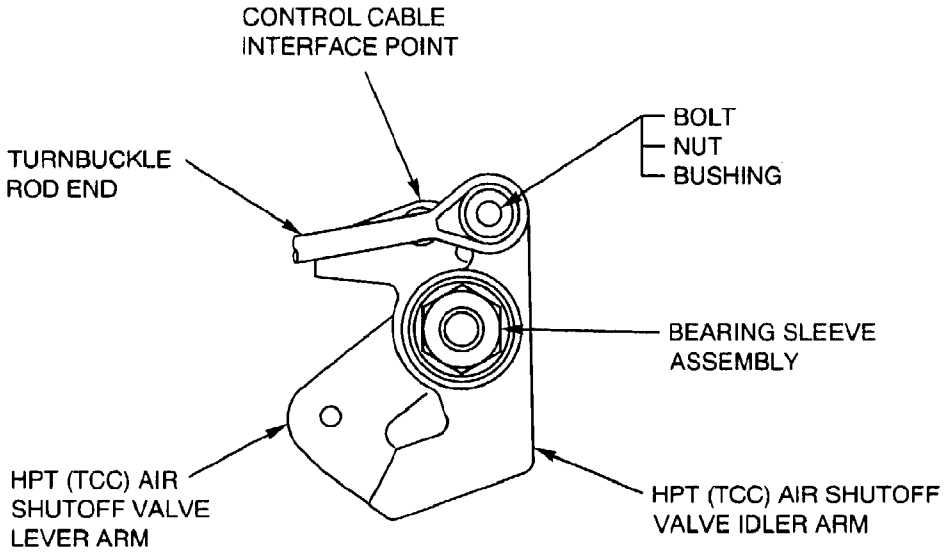
BM5 75 23 02 4 KBP0 00

Idler Arm (Shown in Rig Position)
(Post SB PW4ENG 75-136)
Figure 404



BM5 75 23 02 4 KBN0 00

Idler Arm (Shown in Rig Position) (Phase 3 as Built by P&W) (Pre SB PW4ENG 75-136)
Figure 405



L-B7115 (1298)
PW V

BM5 75 23 02 4 KBQ0 00

Idler Arm (Shown in Rig Position) (Phase 3 as Built by P&W) (Post SB PW4ENG 75-136)
Figure 406

TURBINE CASE COOLING (TCC) AIR SHUTOFF VALVE (LPT) - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Torque Wrench
C. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General
- 75-23-00, P. Block 501	Automatic Turbine Rotor Clearance Control System

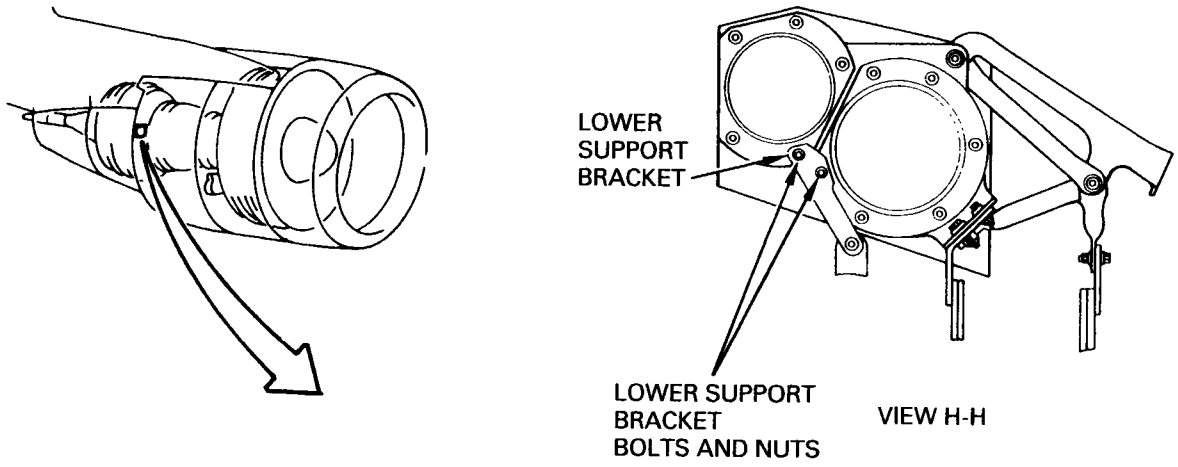
2. Procedure

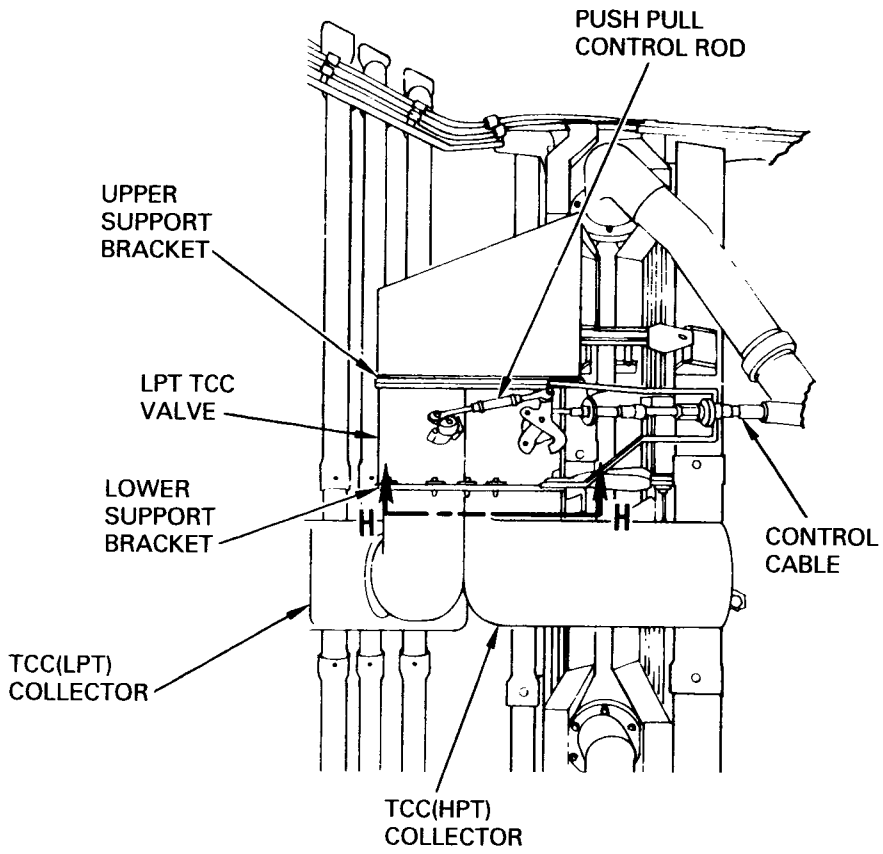
A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401, 402)
(1)Remove bolts and nuts that attach the lower support bracket to the flanges of the HPT and LPT TCC manifold collectors and move support bracket inward toward case.
(Ref. Fig. 401, 402).
(2)Remove bolts and nuts securing lower flange of valve to lower support bracket.
(3)Remove bolts securing upper flange of valve and upper support link to upper support bracket.
(4)Remove bolt, nut and bushing. Disconnect push-pull rod from valve lever.
(5)Slide valve rearward and outward from between support brackets.

C. Installation
(1)Slide valve, with flow arrows pointing downward, into position between upper and lower support brackets while you align the bolt holes.
(2)Attach the upper flange and upper support bracket with Material No.P03-001, lubricated bolts (with longer bolt at inner support bracket location).
TORQUE the upper flange bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
(3)Put the lower support bracket to the flanges of HPT and LPT TTC manifold collectors and attach the lower flange of valve and support bracket with Material No.P03-001, lubricated bolts (with longer bolts at inner support bracket location) and nuts.
(4)TORQUE lower flange bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
NOTE : HPT/LPT TCC valve linkage will be installed during Adjustment/Test.

D. Close-Up and Test





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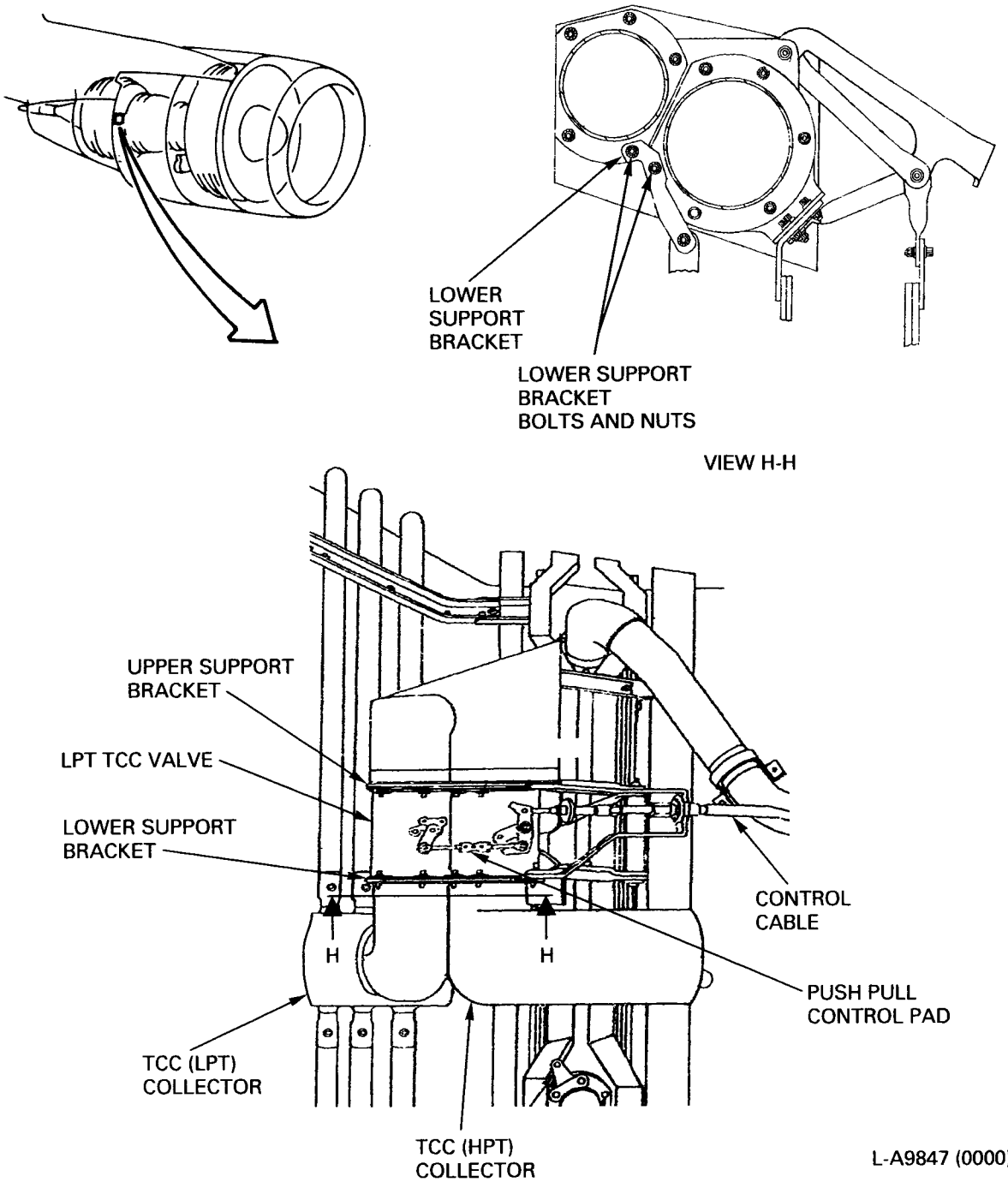
TCC Valve (LPT) (Phase 1 Engines and Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592 Engines)
Figure 401



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TCC Valve (LPT) (Phase 3 Engines As Built by P&W)
Figure 402

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Rig automatic turbine rotor clearance control system (Ref. 75-23-00, P. Block 501).
(3)Close right thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

TURBINE CASE COOLING (TCC) AIR VALVE ACTUATOR - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Torque Wrench
D.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
E.	Packing
F. Material No.P03-001	Oils (Ref. 70-00-00)
G. Material No.P05-289	Special Materials (Ref. 70-00-00)
H. Material No.P05-291	Special Materials (Ref. 70-00-00)
I. Material No.P05-292	Special Materials (Ref. 70-00-00)
J.	Container 5 US Gallons (19 liters)
Referenced Procedures	
- 70-00-00, P. Block 201	Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 75-23-00, P. Block 501	Automatic Rotor Clearance Control System (ARCCS)

2. Procedure

A. Job Set-Up
(1)On the fire control module (overhead panel) of the engine concerned pull the fire handle and install a warning notice to prohibit actuation in normal position (pushed) while maintenance is in progress.
(2)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69

(3)Install access platform.
(4)Open right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1)Disconnect W4P16 harness connector from connector on turbine case cooling (TCC) air valve actuator. Install potective closures.
(2)Remove nut and bolt securing cable rod end bearing to valve idler arm at turbine case cooling (TCC) air shutoff valve (HPT).
(3)Remove lockwire from cable coupling nut and disconnect cable coupling

nut from actuator.

R (4)Remove lockwire or safety cable from overboard drain adaptor and hose. Remove hose.

R (5)Remove lockwire and disconnect the pressure and return hoses at forward lower side of actuator.

NOTE : Be prepared to catch fuel in a container with a minimum capacity of 1 U.S. gallon (3.8 l).

R (6)Remove bolt securing ground strap to rear of actuator.

R (7)Remove bolts and nuts securing the four hinged clamps on actuator mount rails to bracket on HPC case.

NOTE : POST SB PW4 ENG. 75-35 engines are equipped with riveted nut plates on support bracket.

R (8)Lift actuator clear of bracket pins and stop. Release cable end from actuator piston shaft and remove actuator from engine.

R (9)Install protective closures.

R (10)If actuator is to be replaced, comply with the following :

(a)Remove plug from lower rear port of actuator. Remove packing and discard.

(b)Remove lockwire and four clamps.

(c)Install protective closure.

C. Installation (Ref. Fig. 401)

(1)If new actuator is being installed, comply with the following :

(a)Check to make certain that actuator moves freely on mount rails.

(b)Remove protective closures.

(c)Install the new packing (1), lubricated with Engine Oil (Material No.P03-001), to the plug (2).

(d)Install the plug (2), threads lubricated with Engine Oil (Material No.P03-001), to the lower rear port of the actuator. TORQUE the plug (2) to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN). Safety the plug (2) with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

R (2)Install overboard drain hose to adapter.

R (3)If necessary, the hydraulic pressure and the hydraulic return adapters and their packings can be replaced as follows.

(a)Install the new packing (3), lubricated with Engine Oil (Material No.P03-001), to the hydraulic pressure adapter (4).

(b)Install the hydraulic pressure adapter (4), threads lubricated with Engine Oil (Material No.P03-001), to the upper (largest) port of the actuator. Tighten the adapter (4) to a snug fit.

(c)Install the new packing (6), lubricated with Engine Oil (Material No.P03-001), to the hydraulic return adapter (7).

(d)Install the hydraulic return adapter (7), threads lubricated with Engine Oil (Material No.P03-001), to the remaining port (right side) of the actuator. Tighten the adapter (7) to a snug fit.

R (4)Remove protective closures.

R (5)Install two hinged clamps to each mount rail on actuator. Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the clamps shut if so equipped.

R (6)Position and hold actuator clear of pins on bracket on HPC case.

R (7)Connect cable end to actuator piston shaft. Position actuator on bracket with pins engaging holes in actuator mount rails.

R (8)Secure actuator in place with bolts, threads lubricated with Engine Oil (Material No.P03-001), and nuts. TORQUE clamp bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

NOTE : Post SB PW4.ENG.75-35 engines are equipped with riveted nut plates on support bracket.

R (9)Secure ground strap to threaded hole on rear face of actuator with bolt, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolt to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

R (10)Lubricate threads of nuts on return, and pressure hoses with Engine Oil (Material No.P03-001), and attach hoses to their respective ports on actuator.

CAUTION : TO PREVENT OVER TORQUE OF THE ADAPTER AND POSSIBLE DAMAGE TO THE PACKING, HOLD AND KEEP THE ADAPTER FROM TURNING WHEN YOU TORQUE THE HOSE NUT.

R (11)With the correct wrench to hold the adapter (4) from turning, TORQUE the largest (pressure) hose nut (5) (CP11) to between 450 and 500 lbf.in. (5.09 and 5.64 m.daN). Safety the hose nut (5) with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

CAUTION : TO PREVENT OVER TORQUE OF THE ADAPTER AND POSSIBLE DAMAGE TO THE PACKING, HOLD AND KEEP THE ADAPTER FROM TURNING WHEN YOU TORQUE THE HOSE NUT.

R (12)With the correct wrench to hold the adapter (7) from turning, TORQUE the remaining (return) hose nut (8) (CR13) to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN). Safety the hose nut (8) with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

R (13)Lubricate cable coupling nut threads with Engine Oil (Material No.P03-001) and TORQUE nut to between 100 and 125 lbf.in. (1.13 and 1.41 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the nut.

R (14)Secure cable rod end bearing to valve idler arm at turbine case cooling (TCC) air shutoff valve (HPT) with bolt, threads lubricated with Engine Oil (Material No.P03-001), and nuts. TORQUE nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

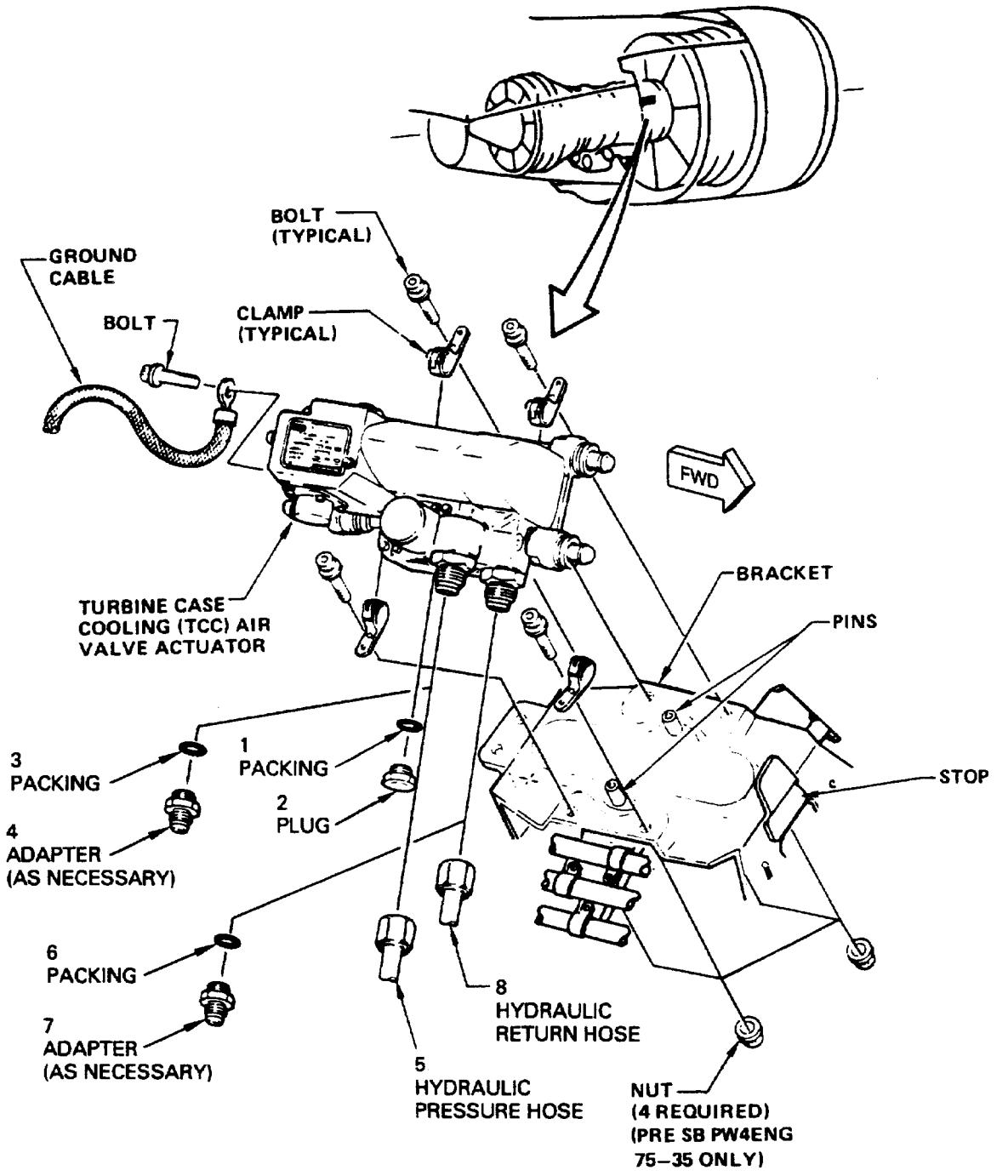
R (15)Remove protective closures. Connect W4P16 harness connector to connector on actuator.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

D. Close-Up and Test

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Rig automatic turbine rotor clearance control system (ARCCS)



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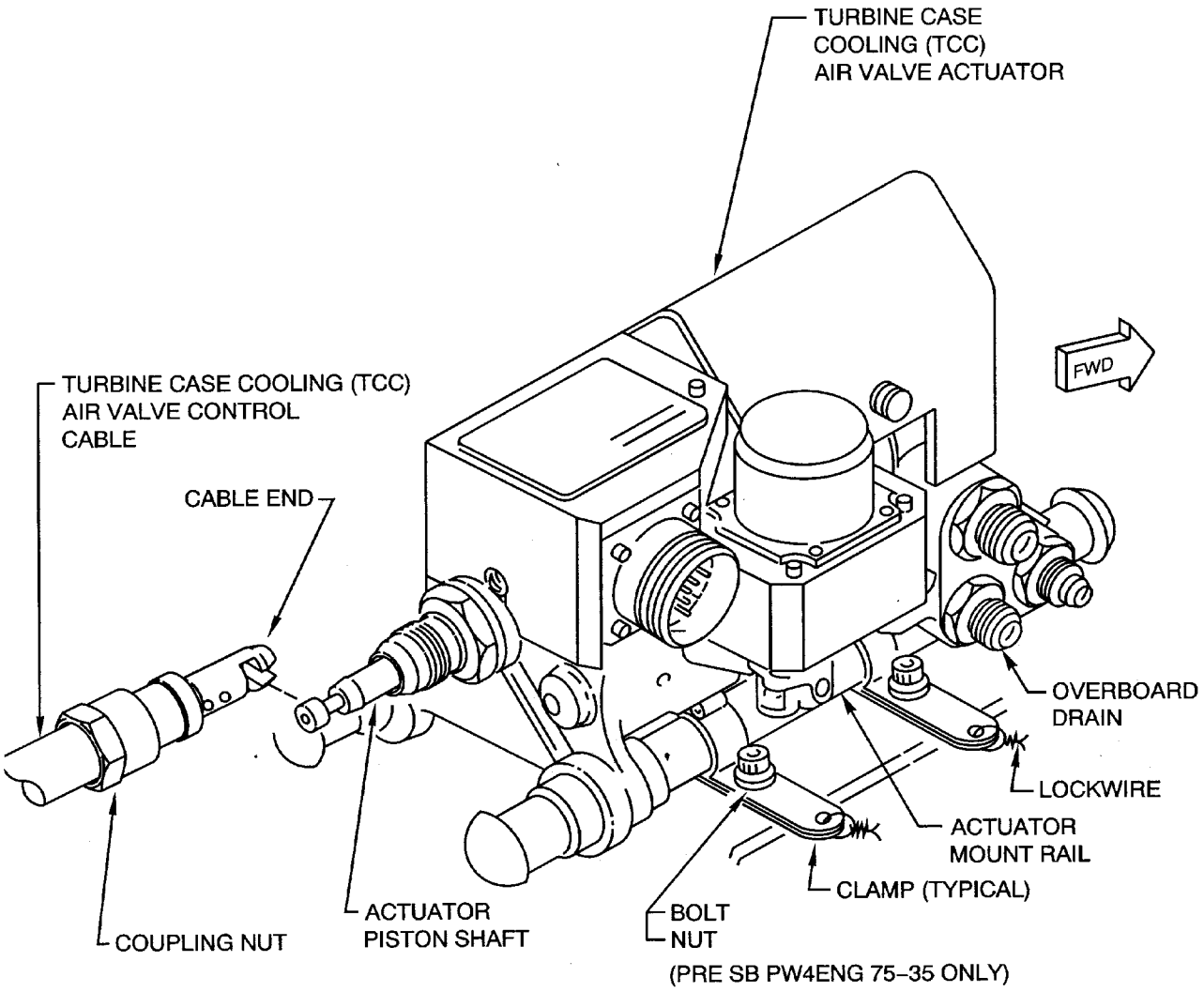
Turbine Case Cooling (TCC) Air Valve Actuator (Sheet 1/2)
Figure 401



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PW V

Turbine Case Cooling (TCC) Air Valve Actuator (Sheet 2/2)
Figure 401

R

(Ref. 75-23-00, P. Block 501).
(3)Remove access platform.
(4)On the appropriate FIRE control module, push the fire handle and remove the warning notice.
(5)Close right thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(6)Remove safety clips and tags and close circuit breakers : 19KS, 21KS, 18KS, 20KS.
(7)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

TURBINE CASE COOLING (TCC) HPT COLLECTOR - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Closures
C.	Gaskets
D.	Seal Plates
E.	Torque Wrench
F.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
G. Material No.P03-001	Oils (Ref. 70-00-00)
H. Material No.P05-059	Special Materials (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 73-24-08, P. Block 401	FADEC Engine Electrical Harness
- 75-23-02, P. Block 401	Turbine Case Cooling (TCC) Air Shut Off Valve HPT
- 75-23-04, P. Block 401	Turbine Case Cooling (TCC) Air Shut Off Valve LPT

2. Procedure

A. Job Set-Up
  (1)Open, safety and tag the appropriate circuit breakers, and open right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
  (2)Remove FADEC thermocouple and airframe cable (W6) (Ref. 73-23-08, P. Block 401).
  (3)Remove turbine case cooling (TCC) air valve (LPT) (Ref. 75-23-04, P. Block 401).
  (4)Remove turbine case cooling (TCC) air valve (HPT) (Ref. 75-23-02, P. Block 401).

B. Removal (Ref. Fig. 401, 402)
  (1)Remove turbine vane cooling air duct lower right (AP02) as follows :
    (a)Remove lockwire, bolts, and bracket securing rear flange of cooling air duct to boss on HPT case.
    (b)Remove bolts securing front flange of cooling air duct to flange of turbine vane cooling air valve on HPC case.
    (c)Remove bolts, nuts, and clamp securing duct to bracket on Flange M and remove tube from engine. Discard the gaskets.
    (d)Install protective closures.
  (2)Remove manifold bolts securing turbine case cooling manifolds to turbine case cooling (TCC) HPT collector.
    (Ref. Fig. 402)
  (3)Slide upper and lower cooling manifolds around case as required to clear turbine case cooling (TCC) HPT collector.
  (4)Remove bolt and nut securing clamp to bracket on turbine case cooling

(TCC) HPT collector.
(Ref. Fig. 402)

(5)Remove bolts and nuts securing turbine case cooling (TCC) HPT collector to TCC valve support bracket and turbine case cooling air shutoff valve (HPC). Remove collector.

(6)Install protective closures.

C. Installation

(1)Remove protective closures.

(2)Position turbine case cooling (TCC) HPT collector onto TCC valve support bracket located on turbine case at 2:30 o'clock position. Secure collector to bracket and turbine case cooling air shutoff valve (HPT) using bolts, threads lubricated with Material No.P03-001, and nuts at six locations with longer bolt in rear at bracket location. (Ref. Fig. 402).

(3)Using bolt, threads lubricated with Material No.P03-001, and nut, install clamp to spacer and secure to bracket detail of collector. Handtighten bolt.

(4)Slide upper and lower turbine case cooling manifolds around case as required to install manifolds onto tube details of collector. Align bolt holes and secure manifolds with eight bolts, threads lubricated with Material No.P03-001. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN). (Ref. Fig. 401).

(5)TORQUE bolts securing collector to support bracket and valve to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(6)TORQUE bolt securing collector bracket to spacer on flange bracket to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(7)Install right turbine vane cooling air duct lower right (AP02) as follows : (Ref. Fig. 401).

(a)Remove protective closures.

(b)Secure a new gasket in place on flange of turbine cooling air valve with Material No.P05-059.

(c)Secure a new gasket in place on HPT pad using Material No.P05-059 at approximately 4 o'clock position.

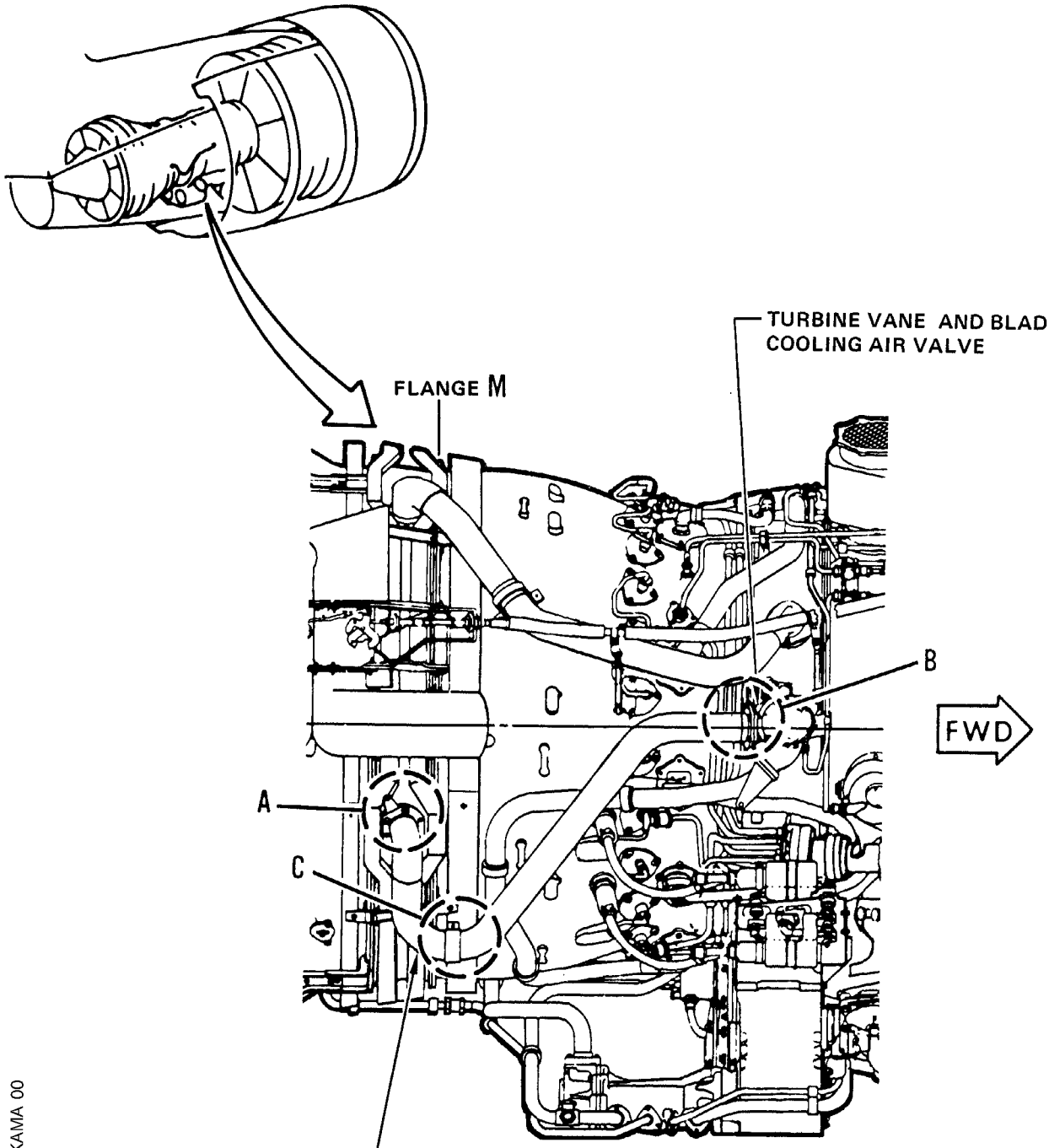
(d)Position cooling air duct to HPT pad and to rear flange of cooling air valve. Secure in place with bolts at forward end, threads lubricated with Material No.P03-001, and larger bolts and bracket at rear flange of duct handtight only.

(e)Position clamp over cooling air duct at bracket on Flange M and secure with bolts, threads lubricated with Material No.P03-001, and nuts. TORQUE clamp bolts to between 85 and 95 lbf. in. (0.96 and 1.07 m.daN)

(f)TORQUE bolts at front flange to between 85 and 95 lbf. in. (0.96 and 1.07 m.daN), then retorque to required limit until required torque is maintained. TORQUE bolts at rear flange to between 180 and 200 lbf. in. (2.03 and 2.26 m.daN), then retorque to required limit without loosening until required torque is maintained. Wirelock bolts at rear flange.

D. Close-Up and Test

(1)Install turbine case cooling (TCC) air valve (HPT) (Ref. 75-23-02, P. Block 401).



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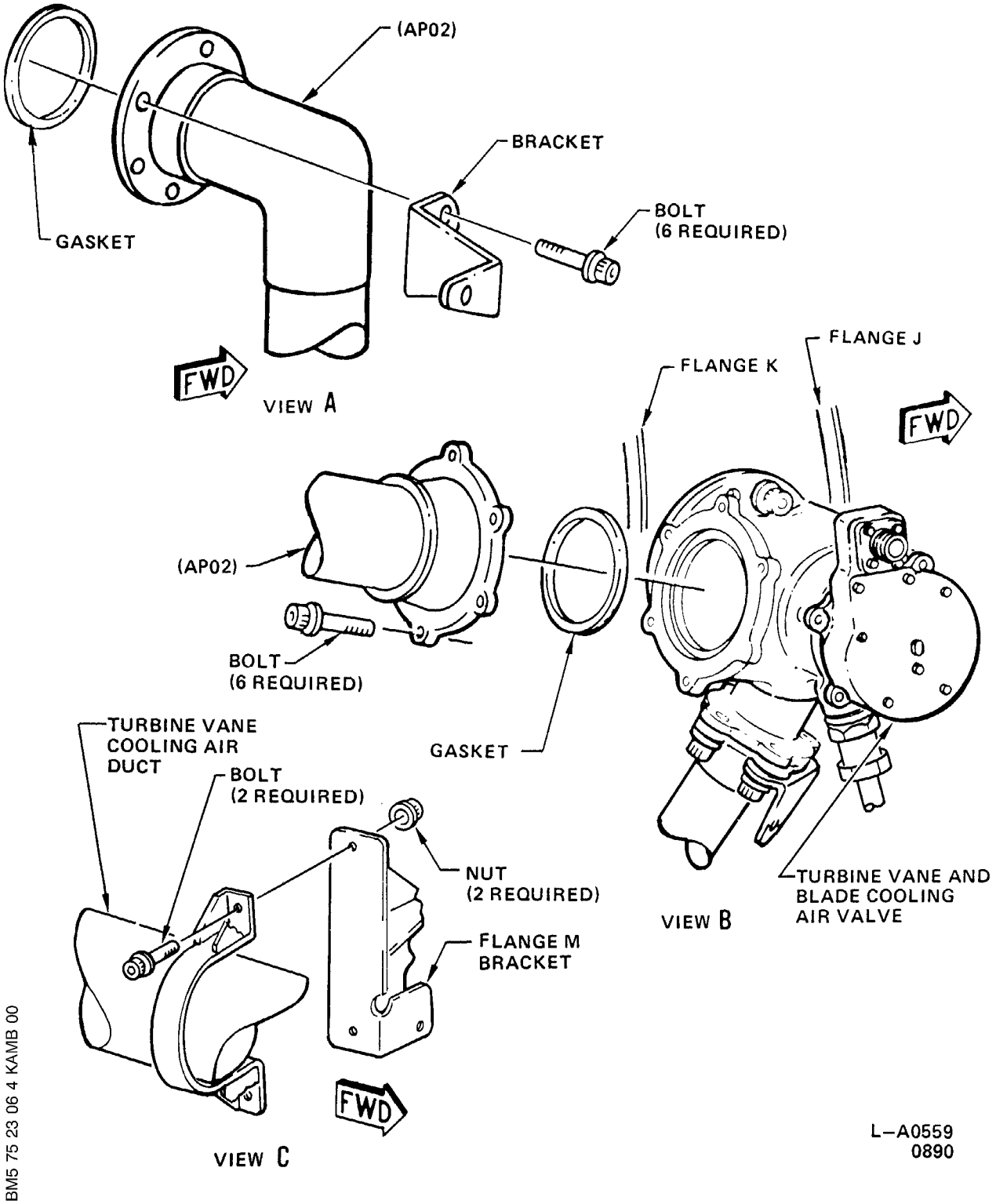
Turbine Vane Cooling Air Duct Removal
Lower Right (Sheet 1/2)
Figure 401



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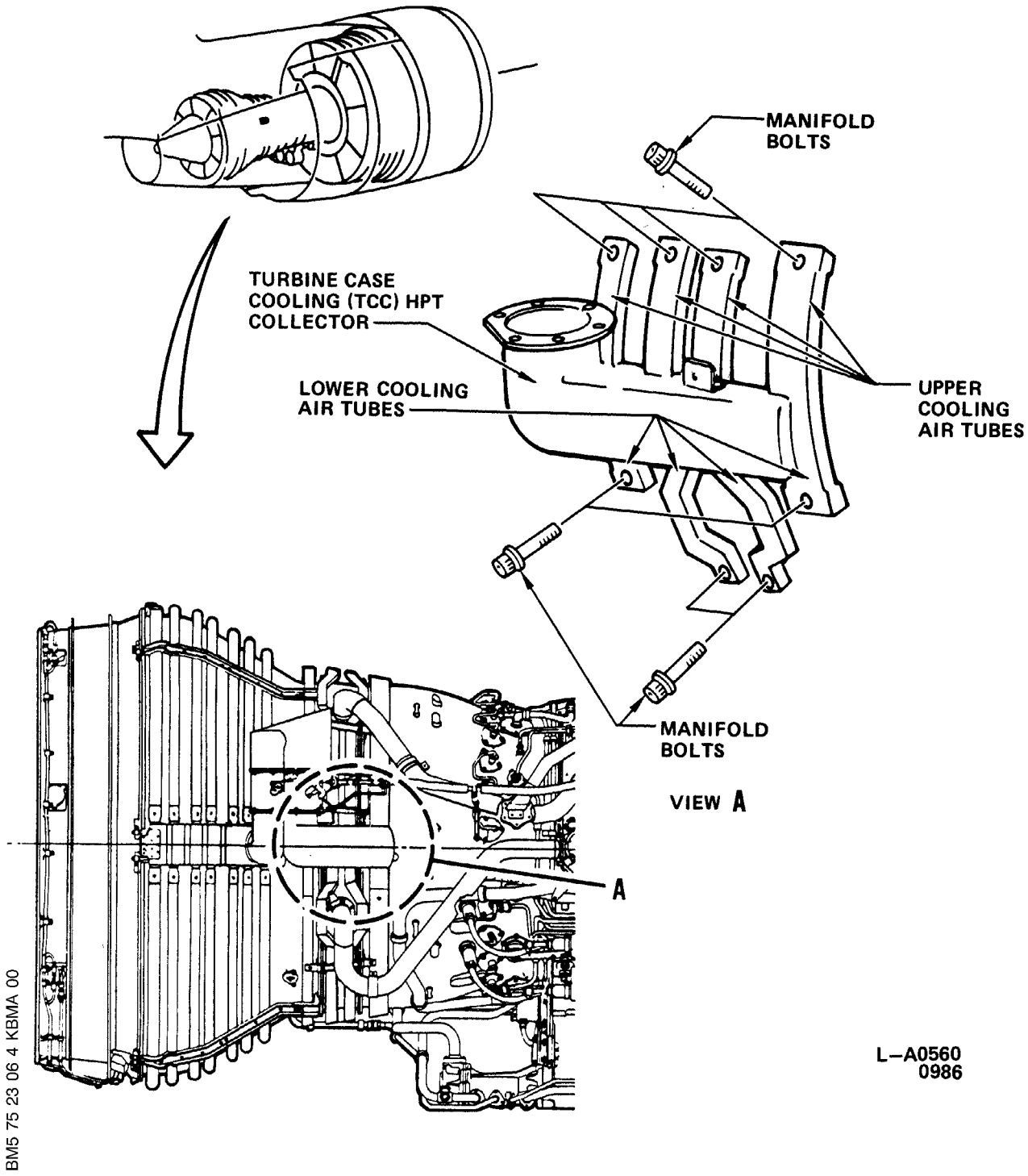
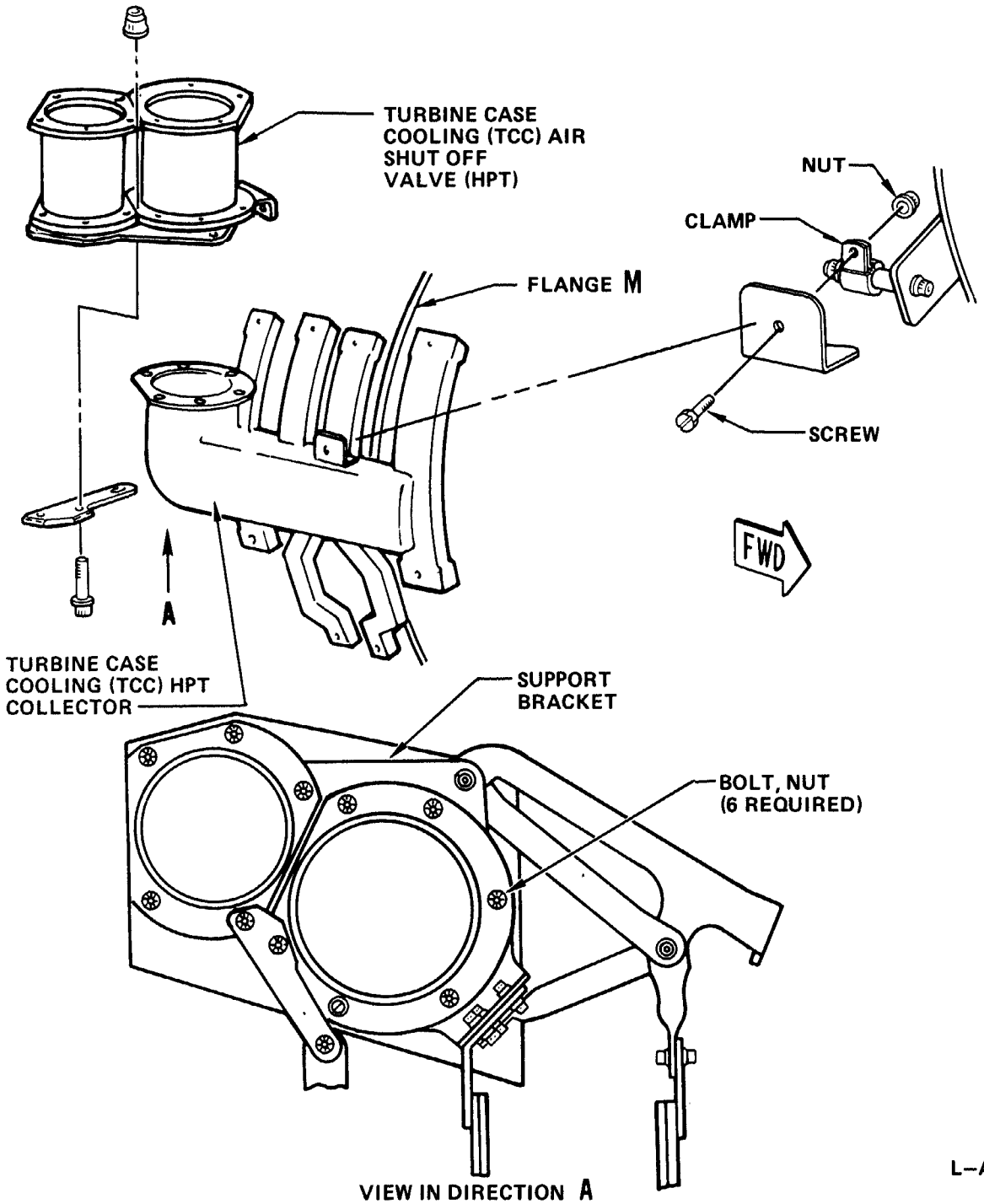
Turbine Vane Cooling Air Duct Clipping
Lower Right (Sheet 2/2)
Figure 401



Turbine Case Cooling (TCC)
HPT Collector (Sheet 1/2)
Figure 402



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Turbine Case Cooling (TCC)
HPT Collector (Sheet 2/2)
Figure 402

(2)Install turbine case cooling (TCC) air valve (LPT) (Ref. 75-23-04, P. Block 401).
(3)Install/Connect FADEC thermocouple and airframe cable (W6) (Ref. 73-23-08, P. Block 401).
(4)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(5)Close right thrust reverser and fan cowl doors and remove safety and tags and close circuit breakers (Rf. 71-13-00, P. Block 301).
(6)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

TURBINE CASE COOLING (TCC) HPT MANIFOLDS - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Packing
C.	Protective Closures
D.	Torque Wrench
E.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
F. Material No.P03-001	Oils (Ref. 70-00-00)
R G. Material No.P06-054	Lubricants (Ref. 70-00-00)
H. Material No.P06-013	Lubricants (Ref. 70.00.00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant-General
- 71-13-00, P. Block 301	Cowl Doors
- 73-24-08, P. Block 401	FADEC Electrical Harness

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Remove TT4.95 wiring harness (Ref. 73-24-08, P. Block 401).

(3)Remove couplings and seals attaching lower duct to starter control valve and intermediate duct assembly. Remove bolts, washers, and nuts attaching duct to two support links. Remove duct.

(4)Remove pylon drain tube.

B. Removal (Ref. Fig. 401, 402, 403)

Pre SB PW4ENG 79-76

(1)Remove No. 4 bearing oil pressure tube assembly (rear) (LP16) as follows : (Ref. Fig. 401)

(a)Remove hose clamps securing spray shield to front tube connection forward of Flange M at approximately 10 o'clock position. Remove shield from engine. Remove lockwire and disconnect tube nut from coupling.

(b)Remove hose clamp securing spray shield to rear tube connection on exhaust case at approximately 10:30 o'clock position. Remove shield from engine. Remove lockwire and disconnect tube nut from strainer housing.

(c)Remove bolt, spacer, nut and clamps securing tube to No. 4 bearing oil scavenge tube rearward of Flange N.
Remove bolts, nuts and clamps securing tube to Flange M, N and P brackets. Remove tube from engine and install protective closures.

End Pre SB PW4ENG 79-76

Post SB PW4ENG 79-76

(2)Remove No. 4 bearing oil pressure tube assemblies (LP47) and (LP48) which replace (LP16) as follows : (Ref. Fig. 402).

(a)Remove clamps and the tube spray shields at the (LP48) tube to the strainer housing connection, at the (LP47) tube to the (LP48) tube connection and at the (LP47) tube to the (LP15) tube connection. See Views G, CA and LA.
(b)Remove clamps, bolts and nuts as shown in Views M, N, B1, P, R and F.
(c)Remove the (LP48) tube from the strainer housing and the (LP47) tube. See views G and CA.
(d)Remove the element housing from the tube nut at approximately the 7 o'clock position. See view G.
(e)Remove the No. 4 bearing strainer element from the element housing. See view G.
(f)Remove and discard packing from the groove in the strainer element. See view G.
(g)Remove bolts and clamps. See views U, T, and S.
(h)Remove the coupling nut that attaches (LP15) tube to the (LP47) tube. See view LA.

End SB PW4ENG 79-76
Pre SB PW4ENG 79-75

(3)Remove No. 4 bearing scavenge tube assembly (rear) (LR06) as follows :
(a)Remove lockwire and disconnect rear scavenge tube elbow from exhaust case internal tube at approximately 10 o'clock position.
(b)Remove bolt, nut, and clamp securing spray shield to bracket on Flange M. Remove hose clamp securing forward end of spray shield to tube and remove spray shield.
(c)Remove lockwire and disconnect tube nut at Flange M from tube adapter.
(d)Remove bolt, nut, and clamp securing tube to bracket on Flange P.
(e)Remove bolts, nuts, and clamps securing tube to brackets on Flange N. Remove rear scavenge tube from engine.

End Pre SB PW4ENG 79-75
Post SB PW4ENG 79-75

(4)Remove (rear) No. 4 bearing scavenge tube assembly (LR06) as follows : (Ref. Fig. 401).
(a)Remove hose clamp securing the tube shield to the bracket inboard side of Flange M at approximately 7 o'clock position. Remove the lockwire and disconnect the (LR05) hose and tube assembly nut from the (LR06) tube coupling.
(b)Remove lockwire and disconnect tube elbow from exhaust case internal tube nut at approximately 10 o'clock position.
(c)Remove bolts, nuts and clamps securing tube to Flange N and P brackets. Remove tube from engine and install protective closures.
(d)Remove bolts, nuts and clamp bracket attached to Flange M and N brackets at approximately 7 o'clock position.

End SB PW4ENG 79-75
Pre SB PW4ENG 79-76

(5)Remove (rear) No. 4 bearing scavenge tube assembly (LR06) as follows : (Ref. Fig. 401).
(a)Remove hose clamp securing the tube shield to the bracket inboard side of Flange M at approximately 7 o'clock position. Remove the lockwire and disconnect the (LR05) hose and tube assembly nut from the (LR06) tube coupling.
(b)Remove lockwire and disconnect tube elbow from exhaust case internal

tube nut at approximately 10 o'clock position.
(c)Remove bolts, nuts and clamps securing tube to Flange N and P brackets. Remove tube from engine and install protective closures.
(d)Remove bolts, nuts and clamp bracket attached to Flange M and N brackets at approximately 7 o'clock position.
End Pre SB PW4ENG 79-76
Post SB PW4ENG 79-76
(6)Remove (rear) No. 4 bearing scavenge tube assemblies (LR21) and (LR22) which replace (LR06) as follows : (Ref. Fig. 402).
(a)Remove clamps and the tube spray shields at the (LR21) tube to (LR22) tube connection and at the (LR05) tube to the (LR21) tube connection. See views E and DE.
(b)Remove clamps on the (LR22). See views A, B, C and D.
(c)Remove the (LR22) tube from the (LR21) tube and the port for the internal tube on the turbine exhaust case. See views E and AP.
(d)Remove clamps, nuts and bolts that secure (LR21) tube. See views F, O, Q and R.
(e)Remove the (LR21) tube from the (LR05) tube. See view DE.
End SB PW4ENG 79-76
Pre SB PW4ENG 79-76
(7)Remove No. 3 bearing oil vent tube assembly (rear) (LD02) as follows :
(a)Remove lockwire and disconnect oil vent tube from adapter on turbine exhaust case at approximately 7 o'clock position.
(b)Remove lockwire and disconnect tube nut at tube connection just rearward of Flange M.
(c)Remove bolts, nuts, and clamps securing tube to Flange P and Flange N brackets.
(d)Remove the bolt, nut, and clamp at approximately the 7:30 o'clock position on the exhaust case that secures the tube to the adjacent PT 495 tube assembly (POST SB PW4 ENG 72-134).
(e)Remove bolt, nut, and clamp securing tube to adjacent tube between Flange N and Flange P
Remove tube from engine and install protective closures.
(8)Remove FADEC PT4.95 pressure tube assembly (rear) (AS02) as follows :
(a)Remove lockwire from tube nut and disconnect from tee (water drain) at 6 o'clock position on PT4.95 manofold, rearward of Flange P (PRE SB PW4 ENG 72-134).
(b)Remove the lockwire and disconnect the tube nut from the tube coupling at the rear of Flange P and approximately the 7 o'clock position (POST SB PW4 ENG 72-134).
(c)Remove the bolt, nut, and clamp that secures the tube to the Flange P bracket at approximately the 7 o'clock position (PRE SB PW4 ENG 72-134).
(d)Remove lockwire from tube connection just rearward of Flange N and disconnect tube nut from tube adapter.
(e)Remove the tube from the engine and install protective closures.
End Pre SB PW4ENG 79-76
Post SB PW4ENG 79-76
(9)Remove the (rear) No. 3 bearing oil vent tube assembly (LD02) and the (rear) FADEC PT4.95 pressure tube assembly (AS02) as follows :

(Ref. Fig. 402).
(a)Remove clamps, nut and bolts from the (AS27) tube, the (LD02) tube, the (AS02) tube and the (LP48) tube. See views H, I, J, K and L.
(b)Remove the bolt that attaches the (AS02) tube to the bracket. See view G.
(c)Remove the (AS02) tube from the (AS03) and (AS27) tubes. (Ref. Fig. 402) (Sheet 1/14).
(d)Remove the (LD02) tube from the (LD01) tube and to the turbine exhaust case. (Ref. Fig. 402) (Sheet 1/14).

End SB PW4ENG 79-76

(10)Remove eight bolts securing manifolds (upper and lower) to HPT cooling air collector detail tubes (Ref. Fig. 403).
(11)Remove bolts and nuts securing front lower HPT cooling air manifold clamps to brackets and remove clamps.
Disengage manifold from collector and remove manifold from engine.
(12)Remove bolts and nuts securing front upper HPT cooling air manifold clamps to brackets and remove clamps. Disengage manifold from collector and remove manifold from engine.
(13)Remove center two bolts and nuts on bridge brackets (six places) to disengage center TCC manifolds (upper and lower) from bridge brackets.
(14)Remove the two end bolts and nuts securing lower bridge brackets (three places) to Flanges M and N brackets.
Disengage lower, center two, cooling air manifolds from collector and remove manifolds engine.
(15)Remove the two end bolts and nuts securing upper bridge brackets (three places) to Flanges M and N brackets.
Disengage upper, center two, cooling air manifolds from collector and remove manifolds from engine.
(16)Remove bolts, nuts and clamps securing upper and lower rear HPT cooling air manifolds to brackets. Disengage manifolds from collector and move rearward for access to brackets.
(17)Remove bolts and nuts securing rear upper and lower HPT cooling manifold brackets to support brackets on Flange N.
(18)Remove bolts and nuts securing LPT bridge brakets to Flange N brackets, as required and remove Flange N brackets for clearance to remove HPT rear cooling manifolds.
(19)Remove rear upper and lower HPT cooling air manifolds.
(20)Install protective closures.

C. Installation (Ref. Fig. 401, 402, 403)
(1)Remove protective closures.
(2)Position rear upper and lower HPT cooling air manifolds around case with open ends toward collector. Do not secure at this time (Ref. Fig. 403).
(3)Reinstall HPT rear support brackets (previously removed for access) to Flange N brackets with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(4)Reinstall LPT TCC front support brackets to Flange N previously removed for access to HPT rear upper and lower cooling air manifolds and secure with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE Flange N nuts to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN).

(5)Secure Flange N LPT support brackets to LPT bridge brackets with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
NOTE : Bolt and nut at approximately the 8 o'clock position holds clamp supporting HPT tube.
(6)Position upper and lower rear HPT cooling air manifolds around case and engage ends to HPT collector. Secure to collector with bolts, threads lubricated with Material No.P03-001 and tighten handtight only.
(7)Install clamps to brackets on rear upper and lower HPT cooling manifolds and secure to support brackets at Flange N with bolts, threads lubricated with Material No.P03-001, and nuts, handtight only.
(8)Install the two center, upper HPT cooling air manifolds to engine and engage open ends to collector. Secure tubes to collector with bolts, threads lubricated with Material No.P03-001, handtight only.
(9)Install and secure upper bridge brackets to support brackets on Flanges M and N with bolts, threads lubricated with Material No.P03-001, and nuts handtight only.
(10)Secure two upper center TCC manifolds to upper (three) bridge brackets with bolts, threads lubricated with Material No.P03-001, clamps, and nuts handtight only.
(11)Install the two center, lower HPT cooling air manifolds to engine and engage open ends to collector. Secure manifolds to collector with bolts, threads lubricated with Material No.P03-001, handtight only.
(12)Install and secure lower bridge brackets to support brackets on Flanges M and N with bolts, threads lubricated with Material No. P03-001, and nuts handtight only.
(13)Secure two lower center TCC tubes to lower (three) bridge brackets with bolts, threads lubricated with Material No.P03-001, clamps, and nuts, handtight only.
(14)Install front upper and lower cooling air tubes to engine engaging open ends with detail tubes of collector. Secure manifolds to collector with bolts, threads lubricated with Material No.P03-001, handtight only.
(15)Install clamps to upper and lower cooling air manifolds brackets and secure with bolts, threads lubricated with Material No.P03-001, and nuts handtight only.
(16)TORQUE bolts securing HPT cooling air manifolds as follows :
(a)TORQUE bolts securing upper and lower HPT cooling manifolds to collector to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(b)TORQUE bolts securing bridge brackets to support brackets on Flanges M and N to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(c)TORQUE bolts securing front and rear cooling air to support brackets to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

Pre SB PW4ENG 79-76

(17)Install FADEC PT4.95 pressure tube assembly (rear) (AS02) as follows : (Ref. Fig. 401).
CAUTION : USE OF LUBRICANTS ON FADEC SENSING TUBES, ADAPTERS OR PACKINGS COULD RESULT IN CONTAMINATION OF FADEC.
(a)Remove protective closures from the tube fittings.
(b)Secure the tube nut to a tee at approximately the 6 o'clock position and rearward of Flange P (PRE SB PW4 ENG 72-134).
(c)Secure the tube nut to the tube coupling at approximately the

7 o'clock position and rearward of Flange P (POST SB PW4 ENG 72-134).

(d)Secure the tube nut to the tube coupling at approximately the 8 o'clock position and rearward of Flange N.

(e)Lubricate the threads of a bolt with Material No.P03-001. Secure the tube with a clamp, bolt, and nut to the bracket on Flange P at approximately the 6:30 o'clock position. TORQUE bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN) (PRE SB PW4 ENG 72-134).

(f)TORQUE tube nuts (both ends) to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN) and wirelock.

(18)Install No. 3 bearing oil vent tube assembly (rear) (LD02) as follows : (Ref. Fig. 401).

(a)Remove protective closures and install oil vent tube to adapters,
R threads lubricated with Material No.P06-054, on exhaust case at approximately 7 o'clock position and on forward end of tube to front oil vent tube just rearward of Flange M. Handtight only.

(b)Install clamps to tube and secure to brackets on Flange N and P with bolts, threads lubricated with Material No.P03-001, and nuts. Tighten handtight only.

(c)Install clamp to tube and secure to adjacent tube between Flange N and Flange P with bolt, threads lubricated with Material No.P03-001, and nut handtight only.

(d)Lubricate the threads of the bolt with Material No.P03-001. Secure the tube to the adjacent PT 4.95 tube assembly with clamps, bolt, and nut at approximately the 7:30 o'clock position and rearward of Flange P (POST SB PW4 ENG 72-134).

(e)TORQUE all clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(f)TORQUE tube nuts (both ends) to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN) and wirelock.

End Pre SB PW4ENG 79-76

Post SB PW4ENG 79-76

(19)Install brackets on the turbine case cooling brackets. Torque the bolts to between 24 and 32 lbf.in. (0.27 and 0.36 m.daN). (Ref. Fig. 402).

(20)Intall the (rear) FADEC PT4.95 tube assembly (AS02) and the (rear) No. 3 bearing oil vent tube assembly (LD02) as follows : (Ref. Fig. 402).

(a)Attach the (LD02) tube to the (LD01) and the turbine exhaust case, handtight only.

(b)Attach the (AS02) tube to the (AS03) and (AS27) tubes, handtight only.

(c)Install bolt to attach the (AS02) tube to the bracket handtight only. See view G.

(d)Install the clamp on the (LD02) tube and the clamp on the (LP48) tube and secure with nut and bolt, handtight only. See view L.

(e)Install the clamp on the (AS02) and (LD02) tubes and secure with a bolt, handtight only. See view H.

(f)Install clamp on the (AS02) and (LD02) tubes and secure with nut and bolt, handtight only. (Ref. Fig. 402) (Sheet 5/14). See view I.

(g)Install clamps on the (AS02) and (LD02) tubes and secure with nut and bolt, handtight only. See view J.

(h)Install clamp on (AS27) and (LD02) tubes and secure with nut and bolt, handtight only. See view K.

(i)TORQUE the (AS02) tube to the (AS03) tube and the (AS27) tube to

between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).
(j)TORQUE the (LD02) tube to the internal tube and the (LD01) tube to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).
(k)TORQUE all clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

End SB PW4ENG 79-76
Pre SB PW4ENG 79-75

(21)Install No. 4 bearing scavenge tube assembly (rear).
(a)Install rear scavenge tube, elbow threads lubricated with Material
R No.P06-0054 to tube nut on internal tube at approximately 10 o'clock position on exhaust case and to adapter, threads lubricated with
R Material No.P06-054, on front scavenge tube at Flange M at approximately 7 o'clock position handtight only.
(b)Install clamp to tube and secure to bracket on Flange P with bolt, threads lubricated with Material No.P03-001, and nut. Handtighten only.
(c)Install clamps to tube and secure to brackets on Flange N with bolts, threads lubricated with Material No.P03-001, and nuts, handtight only.
(d)TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(e)TORQUE tube nut at exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN) and wirelock.
(f)TORQUE tube nut at Flange N connection to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN) and wirelock.
(g)Position spray shield to inboard side of Flange M connection and secure forward end with clamp. TORQUE clamp to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).
(h)Install clamp to rear end of spray shield over tube and secure to Flange N bracket with bolt, threads lubricated with Material No.P03-001, and nut. TORQUE bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

End Pre SB PW4ENG 79-75
Post SB PW4ENG 79-75

(22)Install (rear) No. 4 bearing scavenge tube assembly (LR06) as follows : (Ref. Fig. 401).
R (a)Install rear scavenge tube, threads lubricated with Material No.P06-054 to exhaust case internal tube nut at approximately 10 o'clock position, and to the tube (LR05) coupling forward of Flange M at approximately 7 o'clock position, handtight only.
(b)Install loop clamp bracket on Flange M bracket at approximately 7 o'clock with bolts lubricated with Material No.P03-001, handtight only. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(c)Secure tube to loop clamp bracket on Flange M bracket with one clamp and bolt, lubricated with Material No.P03-001, handtight only. TORQUE clamp bolt between 27 and 30 lbf.in. (0.30 and 0.33 m.daN).
(d)Install clamps, bolts, threads lubricated with Material No.P03-001, and nuts securing tube to Flange N and P brackets. TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(e)TORQUE tube nut at exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Wirelock.
(f)TORQUE tube nut at Flange N connection to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Wirelock.

(g)Position tube shield to inboard side of Flange M connection and secure forward end of shield with hose clamp. TORQUE hose clamp to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

End SB PW4ENG 79-75

Pre SB PW4ENG 79-76

(23)Install (rear) No. 4 bearing scavenge tube assembly (LR06) as follows : (Ref. Fig. 401).

R (a)Install rear scavenge tube, threads lubricated with Material No.P06-054 to exhaust case internal tube nut at approximately 10 o'clock position, and to the tube (LR05) coupling forward of Flange M at approximately 7 o'clock position, handtight only.

(b)Install loop clamp bracket on Flange M bracket at approximately 7 o'clock with bolts lubricated with Material No.P03-001, handtight only. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(c)Secure tube to loop clamp bracket on Flange M bracket with one clamp and bolt, lubricated with Material No.P03-001, handtight only. TORQUE clamp bolt between 27 and 30 lbf.in. (0.30 and 0.33 m.daN).

(d)Install clamps, bolts, threads lubricated with Material No.P03-001, and nuts securing tube to Flange N and P brackets. TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(e)TORQUE tube nut at exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Wirelock.

(f)TORQUE tube nut at Flange N connection to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Wirelock.

(g)Position tube shield to inboard side of Flange M connection and secure forward end of shield with hose clamp. TORQUE hose clamp to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

End Pre SB PW4ENG 79-76

Post SB PW4ENG 79-76

(24)Install (rear) No. 4 bearing scavenge tube assemblies (LR21) and (LR22) which replace (LR06) as follows : (Ref. Fig. 402).

(a)Attach the (LR21) tube to the (LR05) tube handtight only. See view DE.

(b)Install clamps and secure with nuts and bolts, handtight only. See views F, O, R and Q.

(c)Attach the (LR22) tube to the (LR21) tube and the port for the internal tube on the turbine exhaust case, handtight only. Lubricate the threads that are on the internal tube with Material No.P03-001. See views E and AP.

(d)Install clamps on the (LR22) tube and secure with bolts, handtight only. See views A, B, C, and D.

(e)TORQUE the (LR21) tube to the (LR05) tube to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Wirelock.

(f)TORQUE tube (LR21) tube to the (LR22) tube to between 475 and 525 lbf. in. (5.37 and 5.93 m.daN). Wirelock.

(g)TORQUE the internal tube nut to the (LR22) tube to between 270 and 300 lbf.in. (3.05 and 3.38 m.daN). Wirelock.

(25)Install the shields for the No. 4 bearing oil scavenge lines as follows : (Ref. Fig. 402).

(a)Install shield at the (LR05) tube to the (LR21) tube connection. Secure shield with clamp or bolt as applicable. See view DE.

(b)Install shield at the (LR21) tube to the (LR22) tube connection. Secure

shield with clamp or bolt as applicable. See view E.
(c)TORQUE the clamps to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).
(d)TORQUE the nut and bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

End SB PW4ENG 79-76
Pre SB PW4ENG 79-76

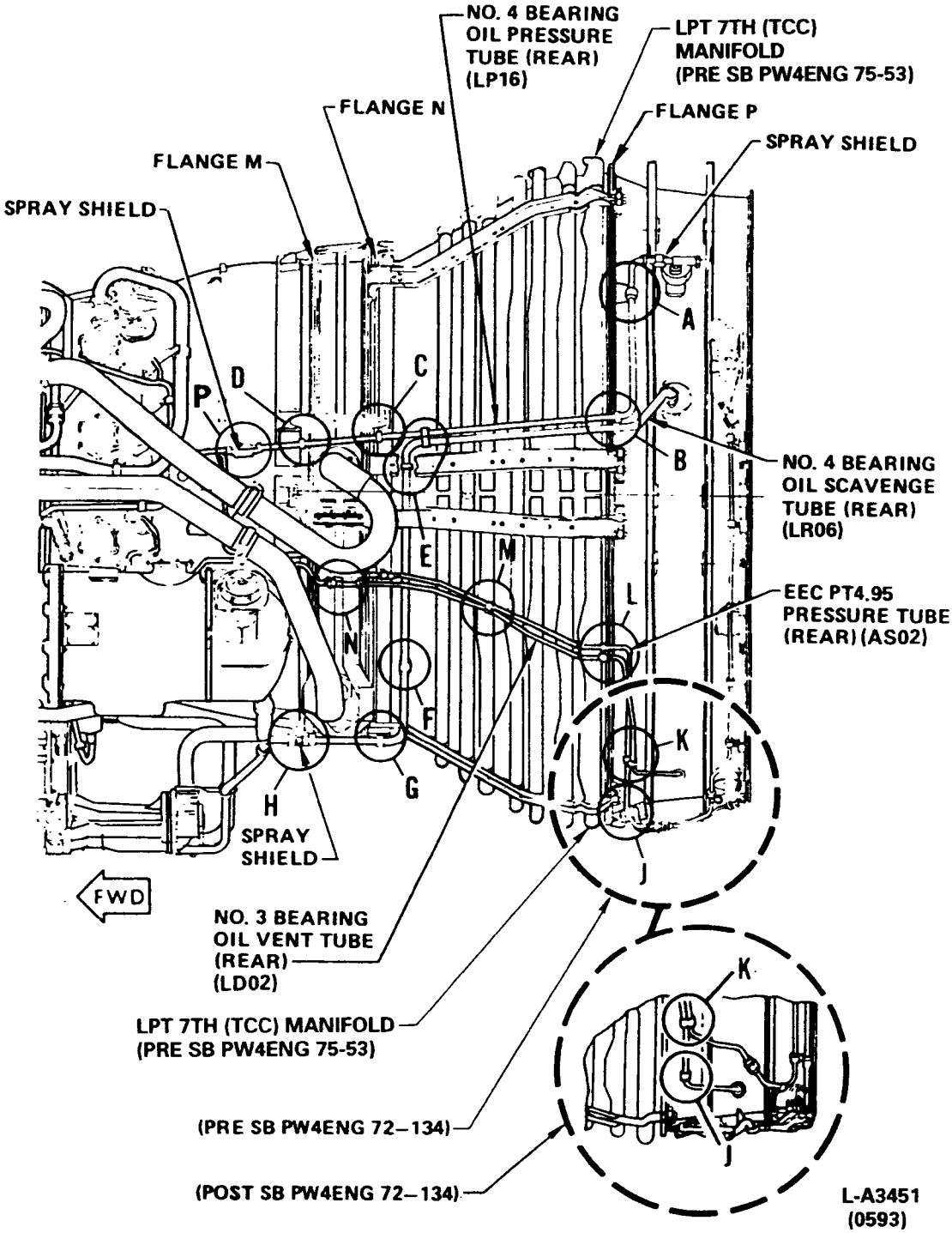
(26)Install No. 4 bearing oil pressure tube assembly (rear) (LP16) as follows : (***//KAMZ//***).
(a)Install pressure tube, threads lubricated with Material No.P03-001, to No. 4 bearing strainer housing and tube coupling forward of Flange M. Handtight only.
(b)Install clamps, bolts, threads lubricated with Material No.P03-001, and nuts securing tube to Flange M, Flange N and Flange P brackets. TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN). Install clamps, bolt, threads lubricated with Material No.P03-001, spacer and nut securing tube to No. 4 bearing oil scavenge tube rearward of Flange N. TORQUE bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
(c)TORQUE tube nuts (both ends) to between 450 and 500 lbf.in. (5.08 and 5.65 m.daN) and secure with lockwire.
(d)Install spray shield to inboard side of pressure tube connection at 10:30 o'clock position at Flange P. Secure with hose clamps and TORQUE to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).
(e)(Pre SB PW4 ENG 79-54) (Ref. Fig. 401) (Sheet 8/8) Install spray shield to inboard side of pressure tube front connection forward of Flange M. Secure with hose clamp and TORQUE to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).
(f)(Post SB PW4 ENG 79-54) (Ref. Fig. 401) (Sheet 8/8) Install the spray shield to the inboard side of the pressure tube connection forward of Flange M. Secure the forward end of the shield to the bracket on the diffuser case with a clamp, bolt lubricated with Material No.P03-001. TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN). Secure the rear of the shield with a hose clamp and TORQUE to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

End Pre SB PW4ENG 79-76
Post SB PW4ENG 79-76

(27)Install (rear) No. 4 bearing oil pressure tube assemblies (LP47) and (LP48) which replace (LP16) as follows. Also install the No. 4 bearing strainer element as follows : (Ref. Fig. 402).
(a)Attach the coupling nut on the (LP15) tube to the (LP47) tube, handtight only. See view LA.
(b)Install clamps and secure with bolts. See views U, T and S.
(c)Install packing, lubricated with Material No.P03-001 to the groove in the No. 4 bearing strainer element. See view G.
(d)Install the No. 4 bearing strainer element into the No. 4 bearing strainer element housing, handtight only. Lubricate threads with Material No.P03-001. See view G.
(e)Install the element housing, lubricated with Material No.P03-001 on to the tube nut at approximately the 7 o'clock position, handtight only. See view G.
(f)Attach the (LP48) tube to the strainer housing and the (LP47) tube,

handtight only. See views G and CA.
(g)Install clamps and secure with bolts and nuts as necessary. See views M, N, B1, P, R and F.
(h)TORQUE the strainer to the strainer housing to between 150 and 170 lbf.in. (1.70 and 1.92 m.daN). Wirelock.
(i)TORQUE the internal tube nut to the strainer housing to between 270 and 300 lbf.in. (3.05 and 3.38 m.daN). Wirelock.
(j)TORQUE the (LP48) tube to the strainer housing to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Wirelock.
(k)TORQUE the (LP48) tube to the (LP47) tube to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Wirelock.
(l)TORQUE the (LP15) tube to the (LP47) tube to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Wirelock.
(m)TORQUE all the installed clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(28)Install the shields for the No. 4 bearing oil pressure lines as follows : (Ref. Fig. 402).
(a)Install shield at the (LP47) tube to the (LP15) tube connection. Secure shield with clamps. See view LA.
(b)Install shield at the (LP47) tube to the (LP48) tube connection. Secure shield with clamps. See view CA.
(c)Install shield at the (LP48) tube to the strainer housing connection. Secure shield with clamps. See view G.
(d)TORQUE all clamps to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).
End SB PW4ENG 79-76
(29)Position pylon drain-tube-to-pylon to overboard drain tube and to pylon drain bracket tube. Secure with coupling nuts, fingertight. Install loop clamps, bolts, washers, and nuts. TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN). TORQUE tube coupling nuts to between 450 and 500 lbf.in. (5.08 and 5.65 m.daN).
(30)Install lower duct.
(a)Ensure support link is set at nominal length of 3.10 inches (78.74 mm).
(b)Lubricate inside surface of couplings with Material No.P06-013.
(c)Position lower duct to intermediate duct and to starter control valve. Secure with couplings and seals. Tighten couplings fingertight.
(d)Adjust and connect support links to duct with bushings, bolts, washers and nuts with no preload. TORQUE nut to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN). TORQUE support link locking nut to between 100 and 140 lbf.in. (1.13 and 1.15 m.daN).
(e)TORQUE couplings to value indicated on coupling bands. Tap outer perimeter of couplings with plastic mallet while tightening.

D. Close-Up and Test
(1)Connect/Install FADEC thermocouple and airframe cable (W6) (Ref. 73-24-08, P. Block 401).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



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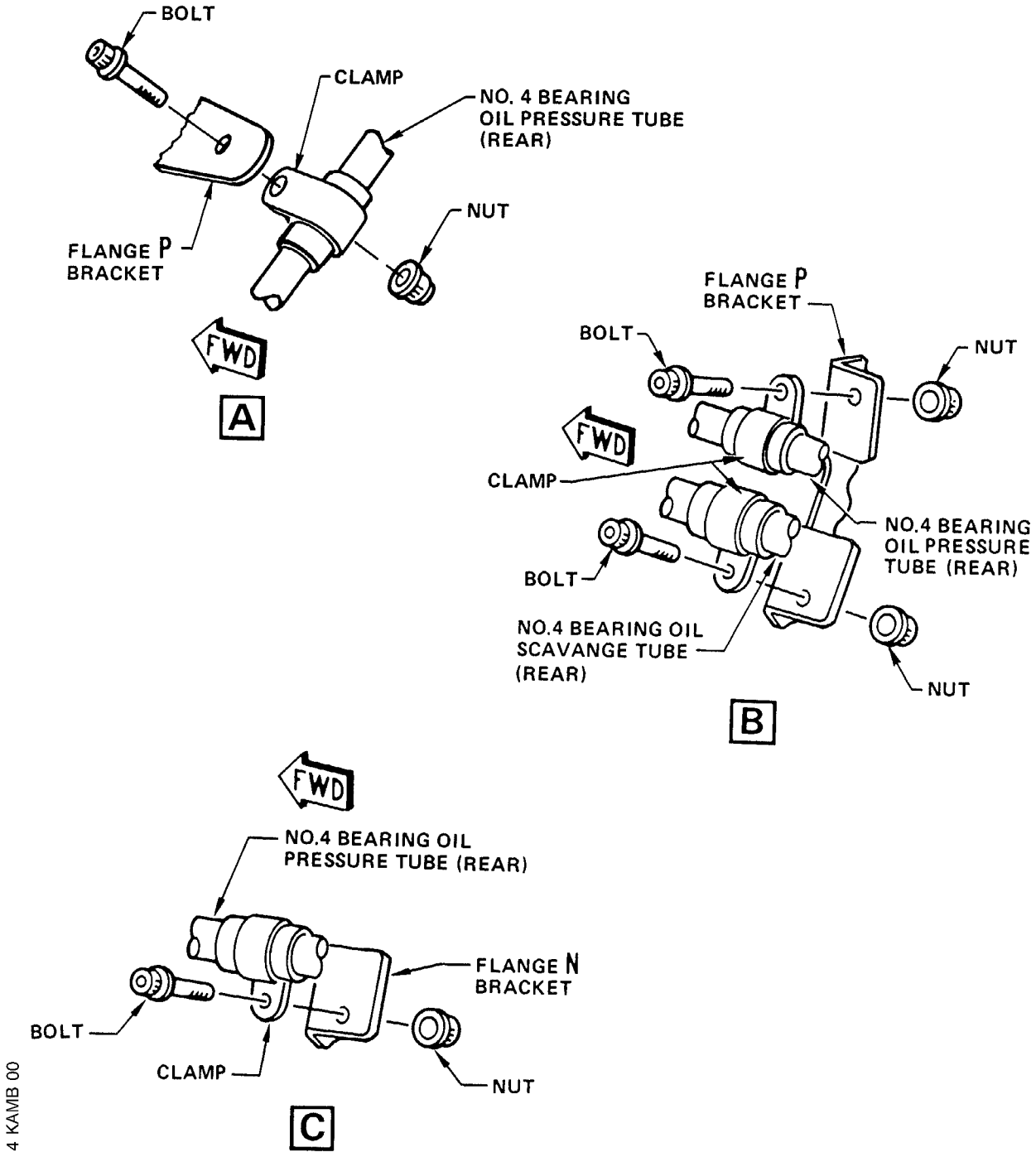
External Tube Clipping Views (Sheet 1/10)
Figure 401



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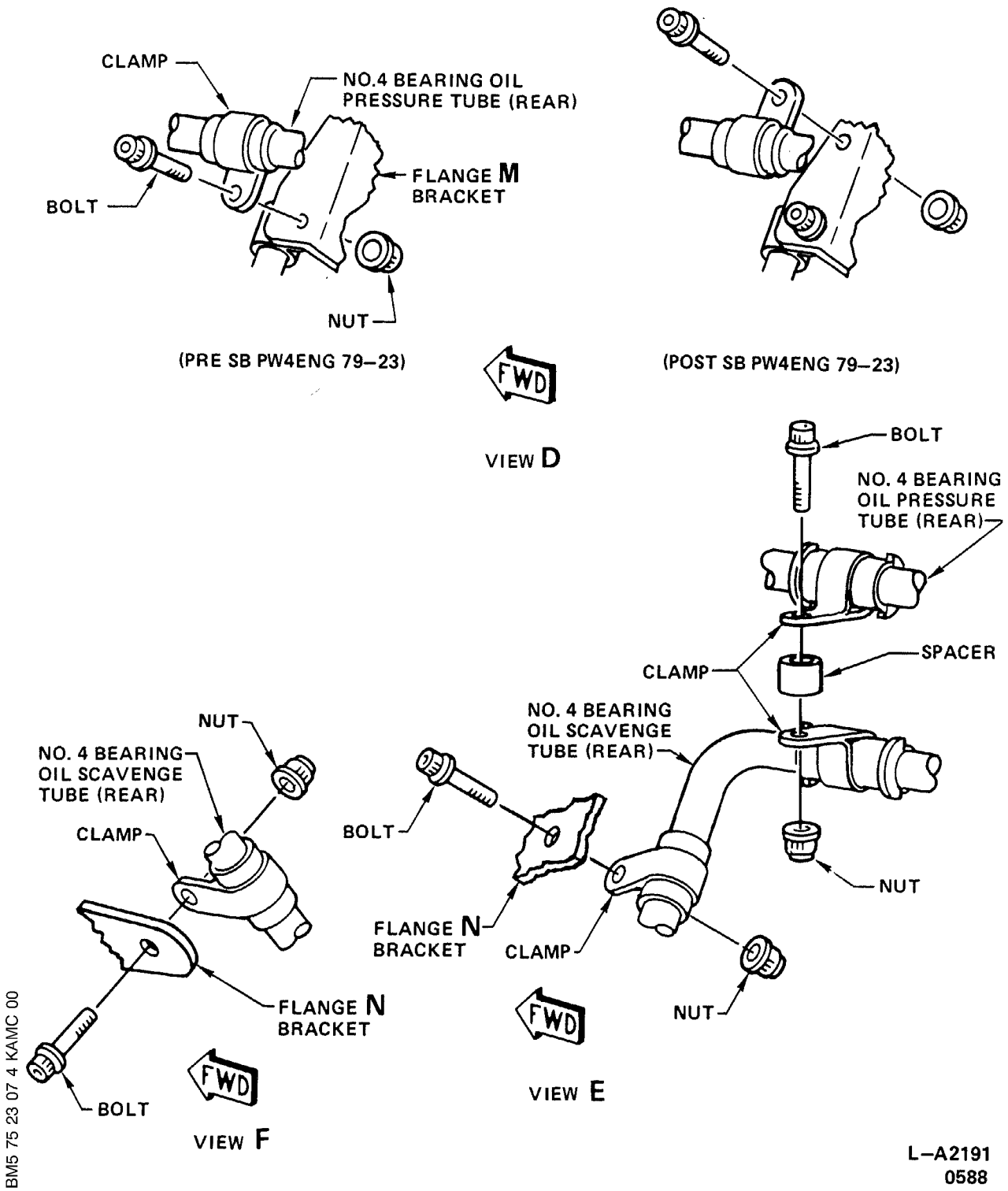
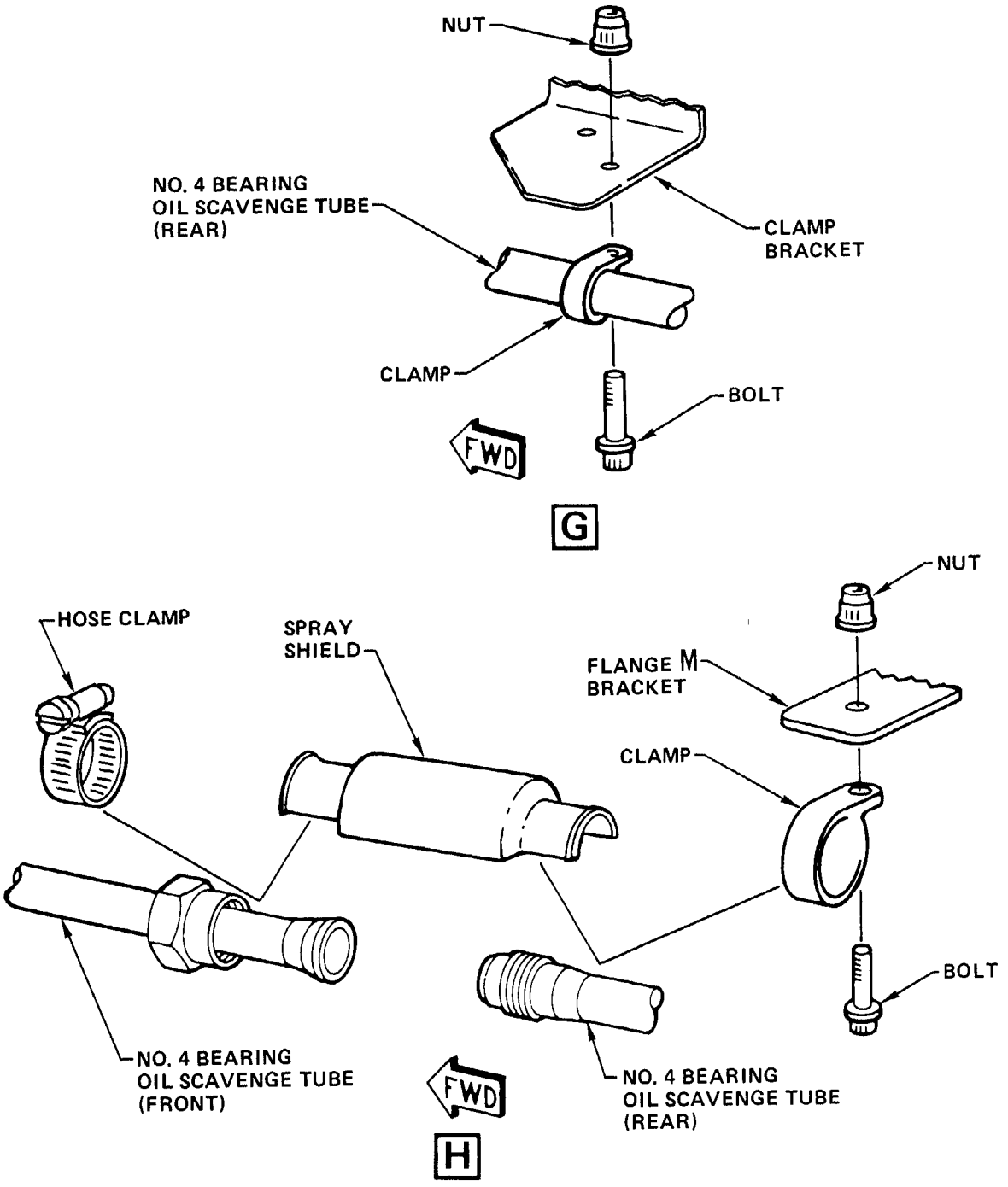
External Tube Clipping Views (Sheet 2/10)
Figure 401



External Tube Clipping Views (Sheet 3/10)
Figure 401



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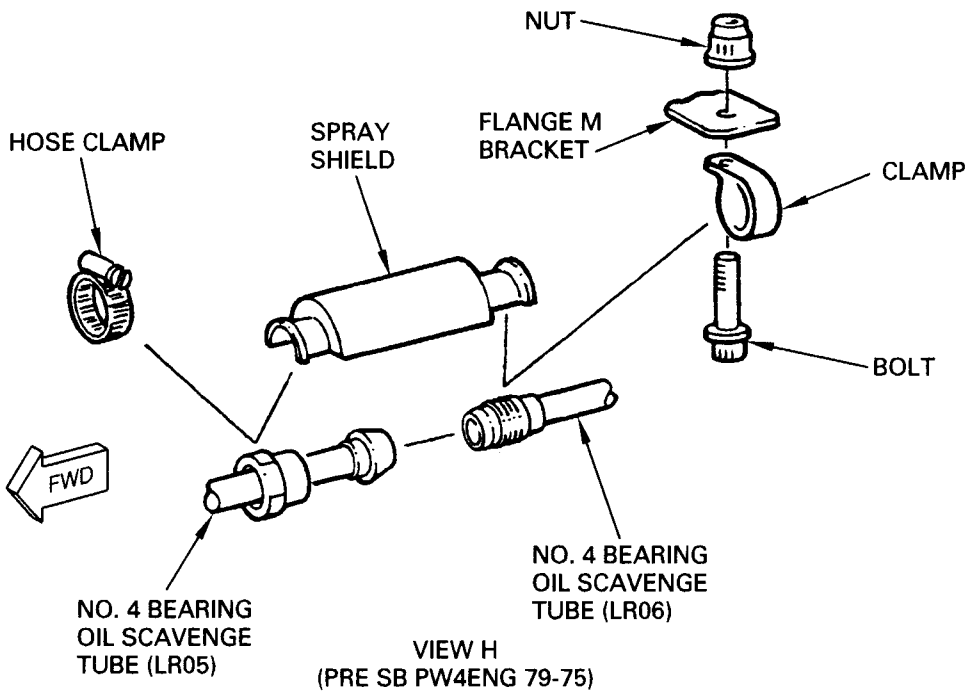
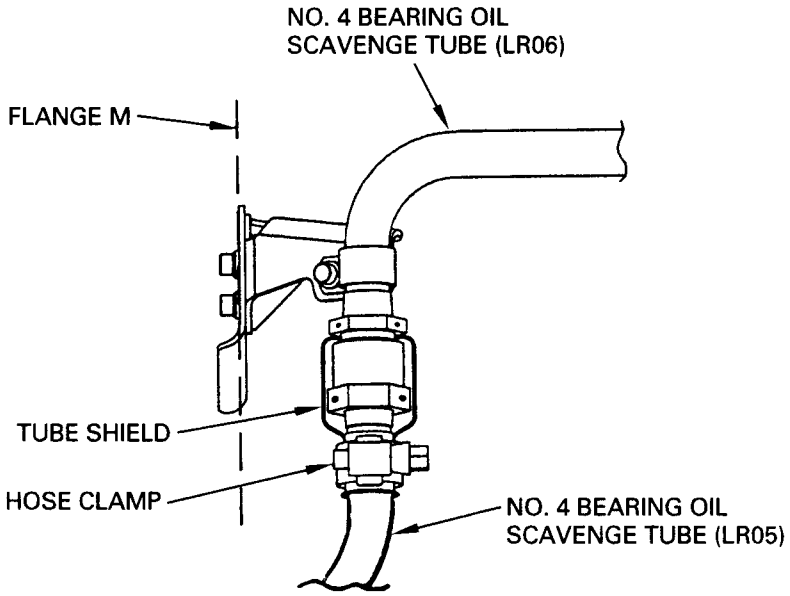
External Tube Clipping Views (Sheet 4/10)
Figure 401





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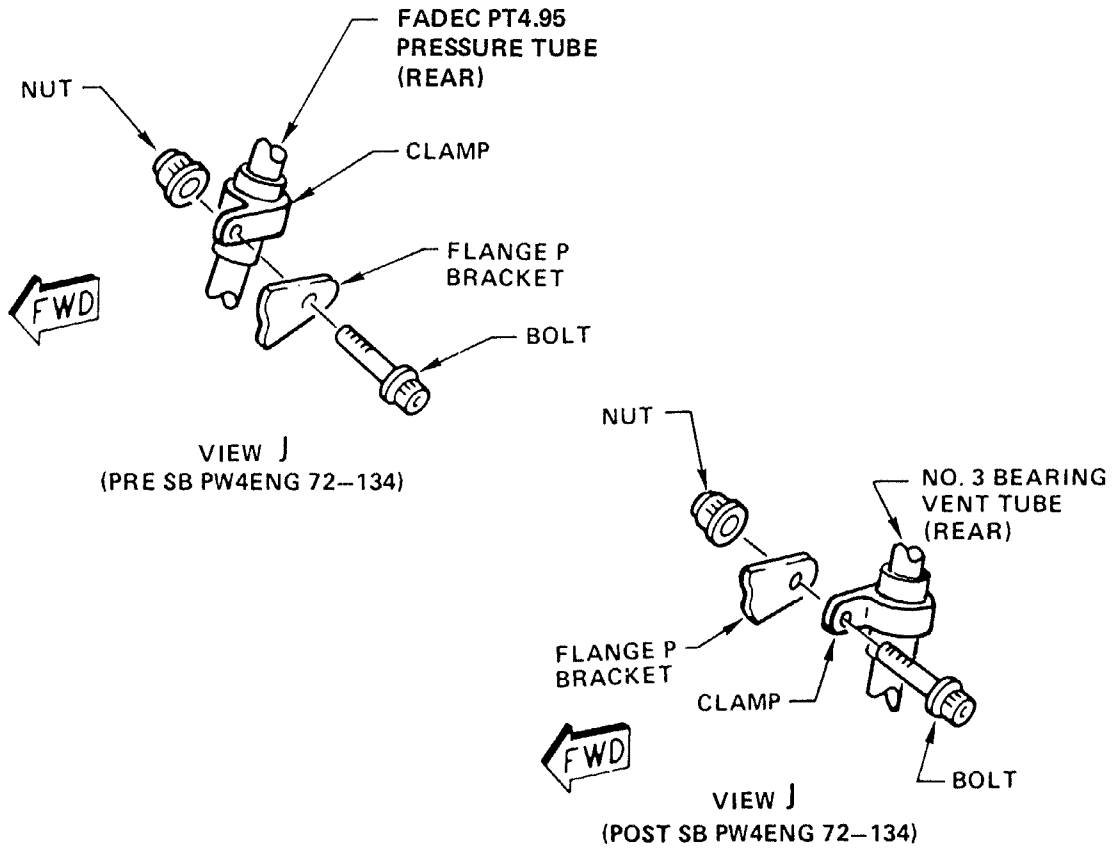
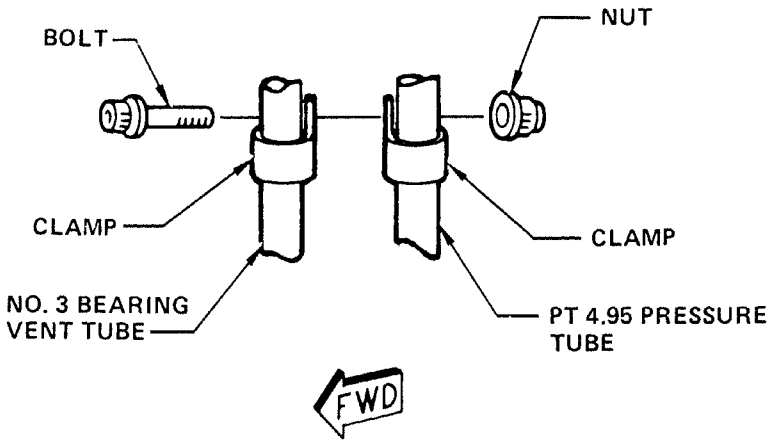
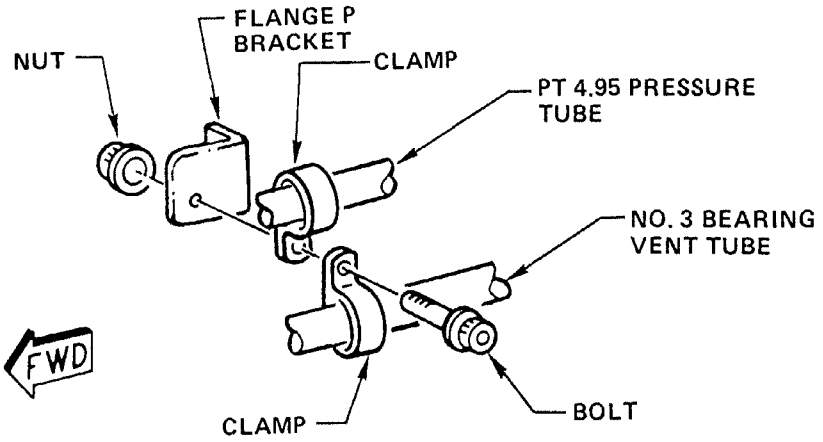
External Tube Clipping Views (Sheet 5/10)
Figure 401



External Tube Clipping Views (Sheet 6/10)
Figure 401



VIEW K
(POST SB PW4ENG 72–134)



VIEW L

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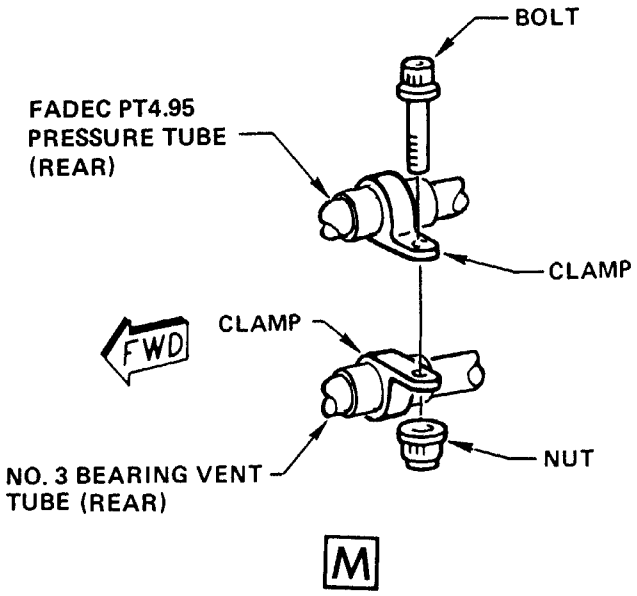
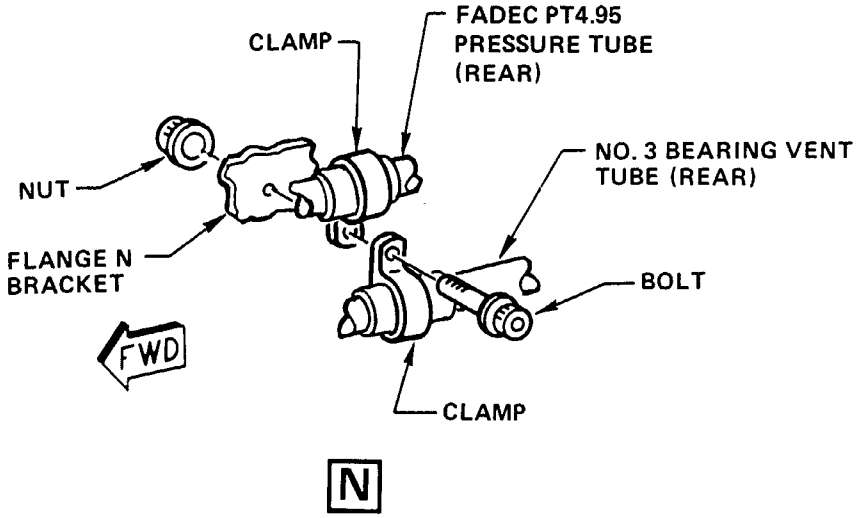
External Tube Clipping Views (Sheet 7/10)
Figure 401





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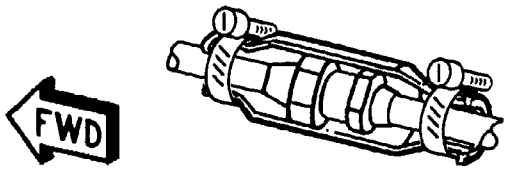
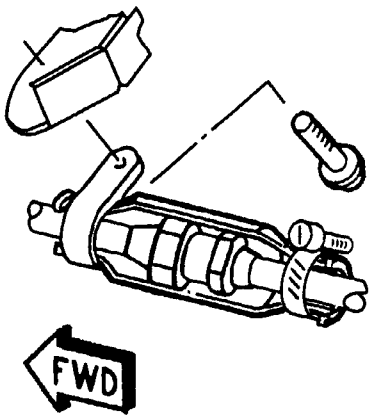
External Tube Clipping Views (Sheet 8/10)
Figure 401



VIEW P
(PRE SB PW4ENG 79-54)

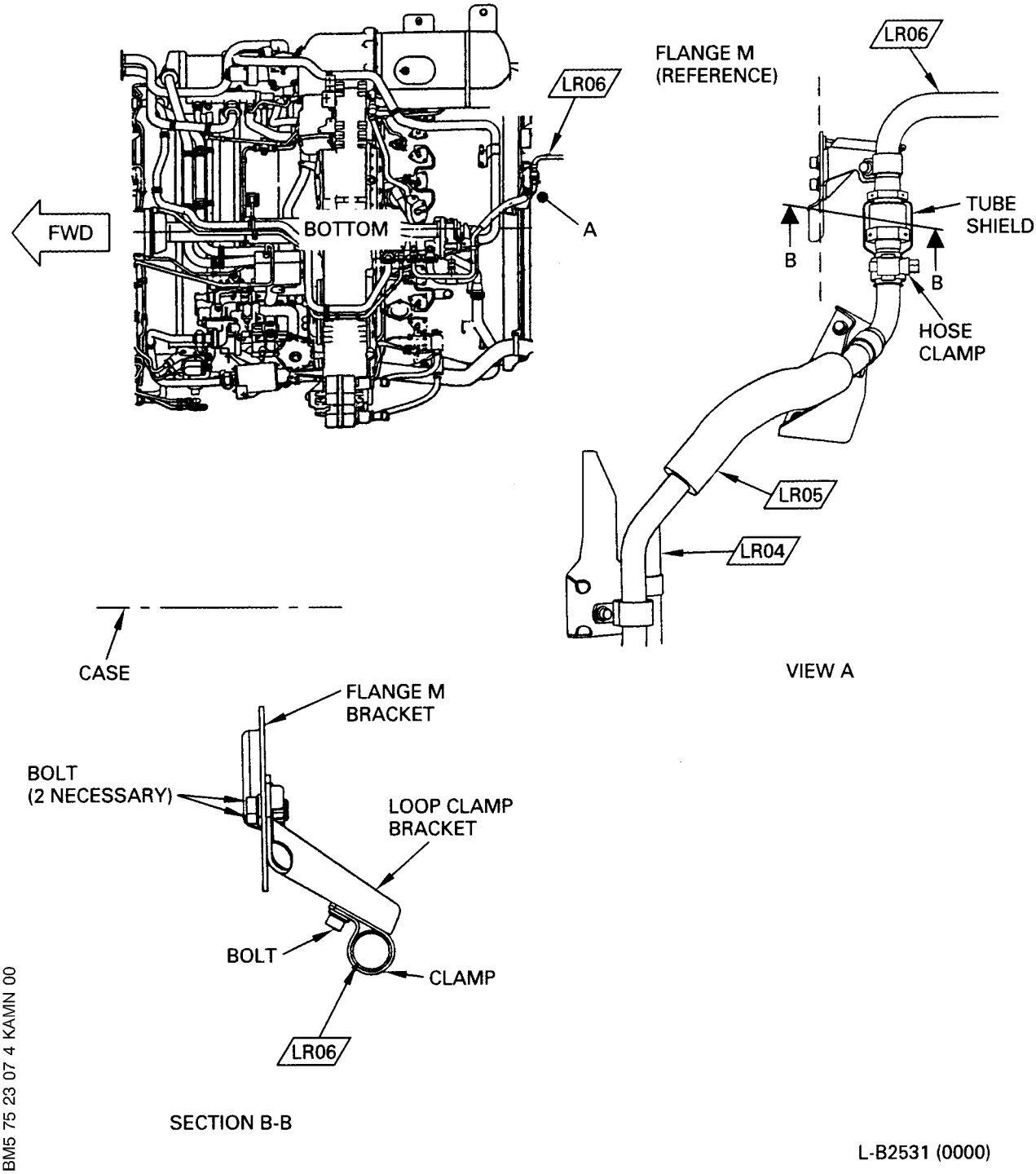


VIEW P
(POST SB PW4ENG 79-54)

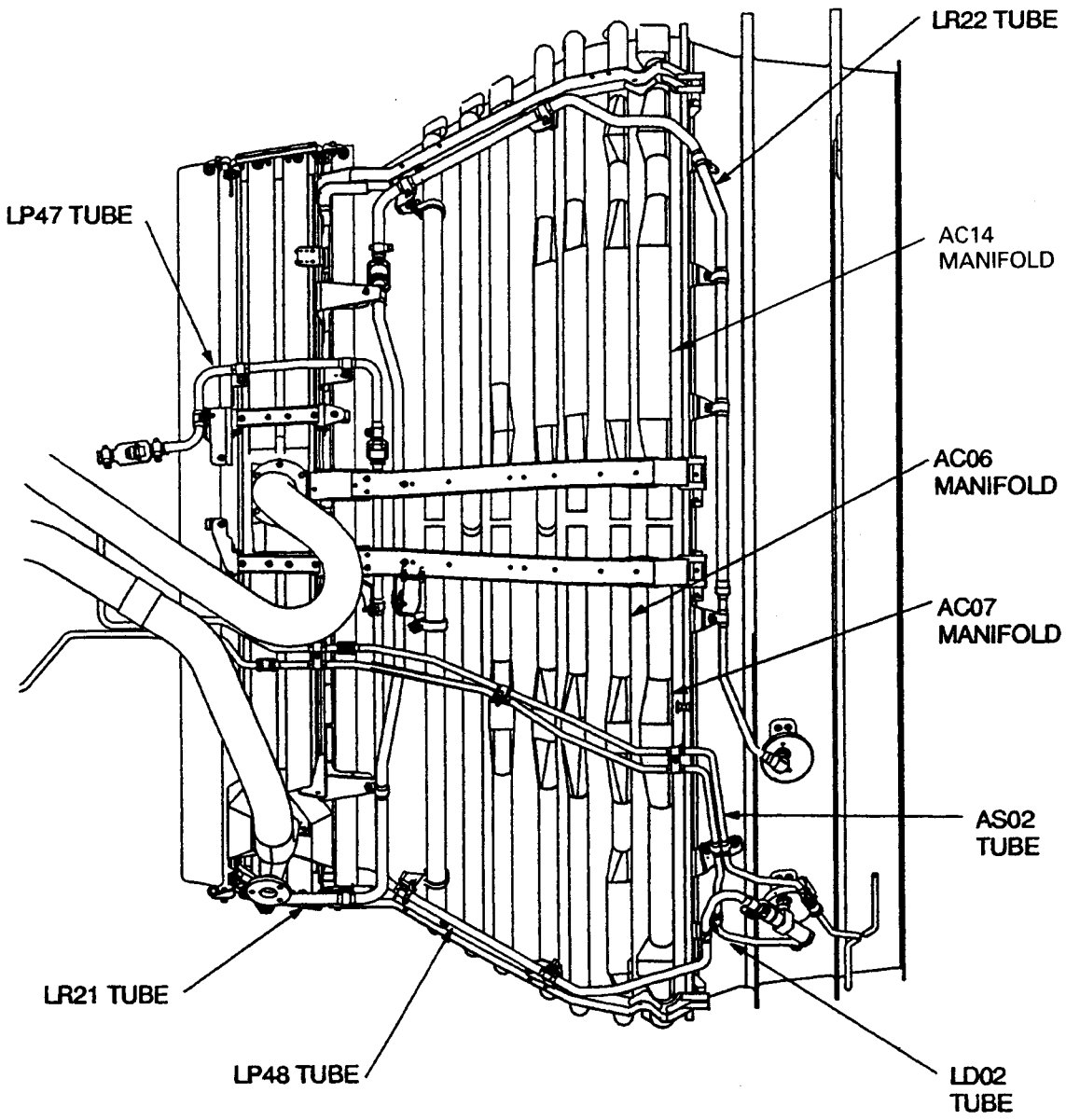
L-A6824 (0000)

BM5 75 23 07 4 KAMJ 00

External Tube Clipping Views (Sheet 9/10)
Figure 401

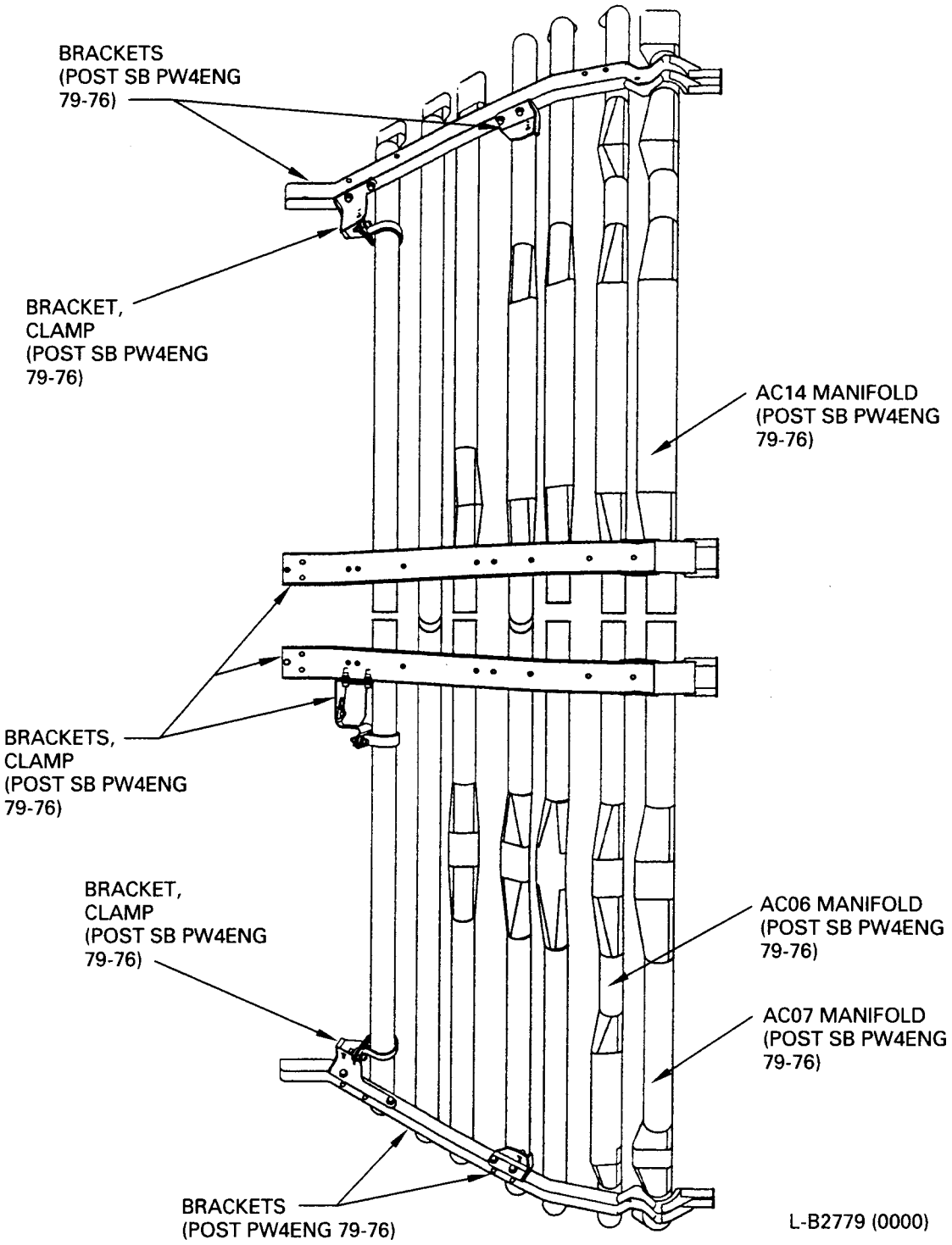


External Tube Clipping Views (Post SB PW4ENG 79-75)
(Sheet 10/10)
Figure 401



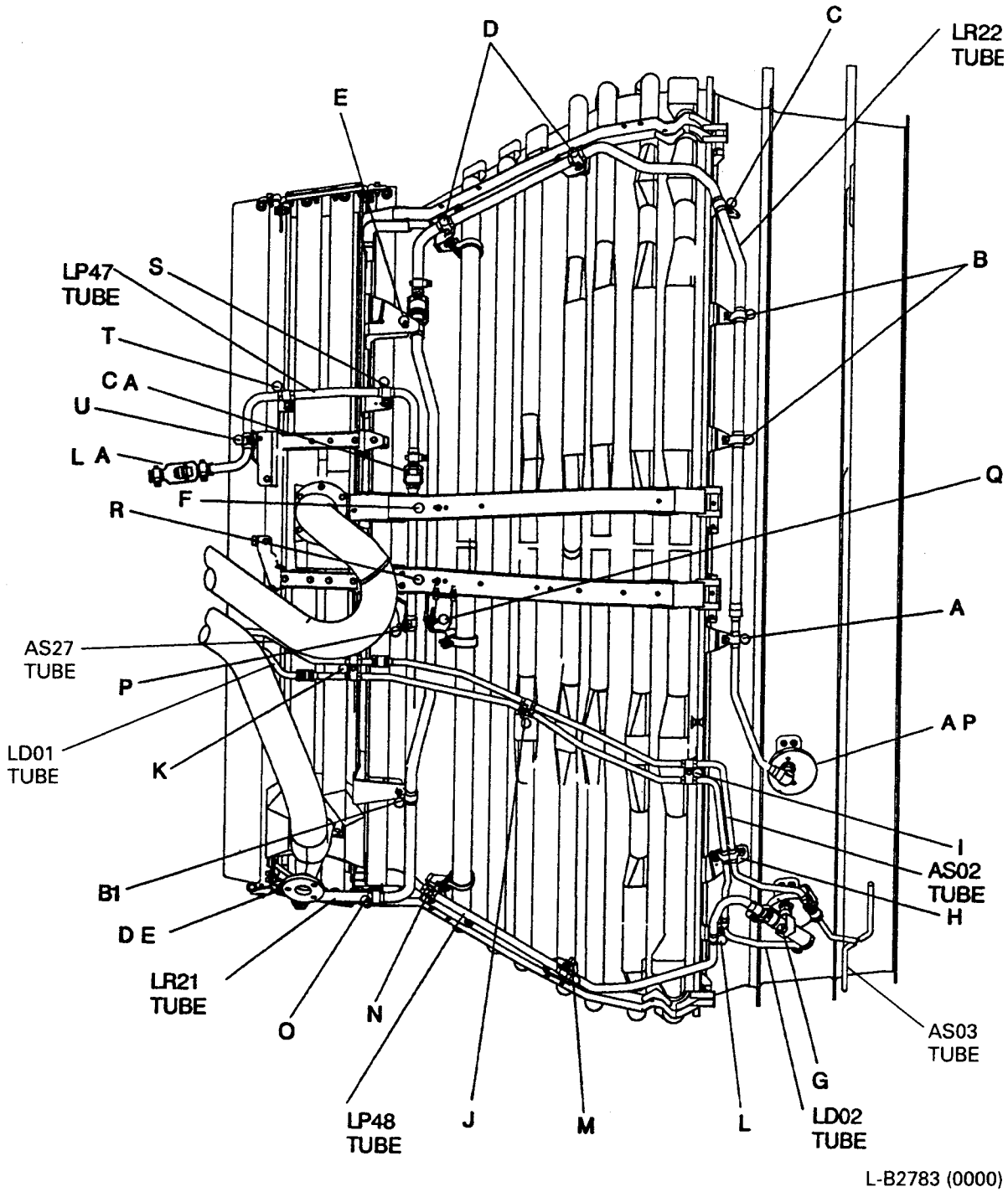
BM5 75 23 07 4 KPMA 00

LPT Turbine Case Cooling-Manifolds Clipping
(Post SB PW4ENG 79-76) (Sheet 1/14)
Figure 402



BM5 75 23 07 4 KPMB 00

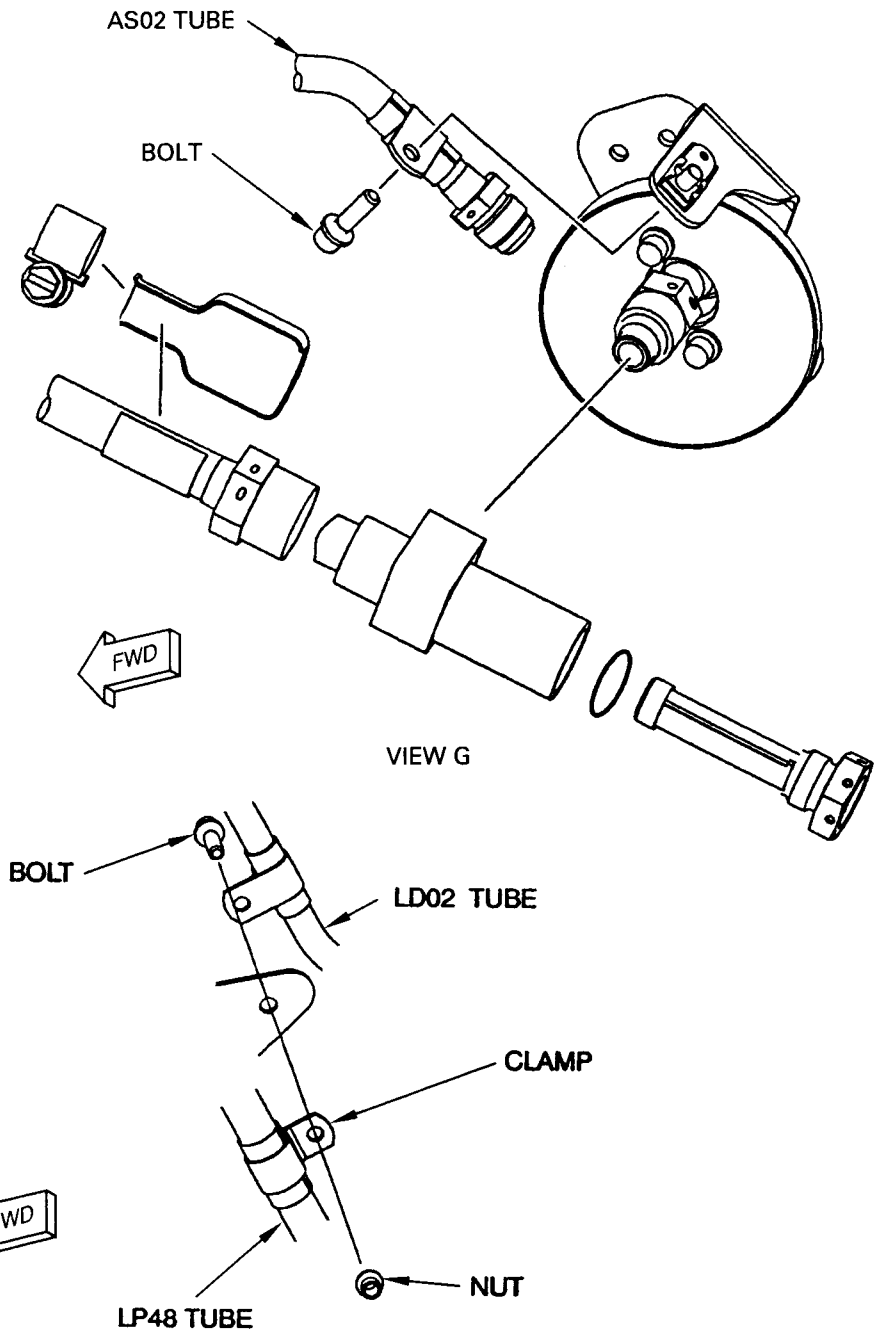
LPT Turbine Case Cooling-Manifolds Clipping
(Post SB PW4ENG 79-76) (Sheet 2/14)
Figure 402



L-B2783 (0000)

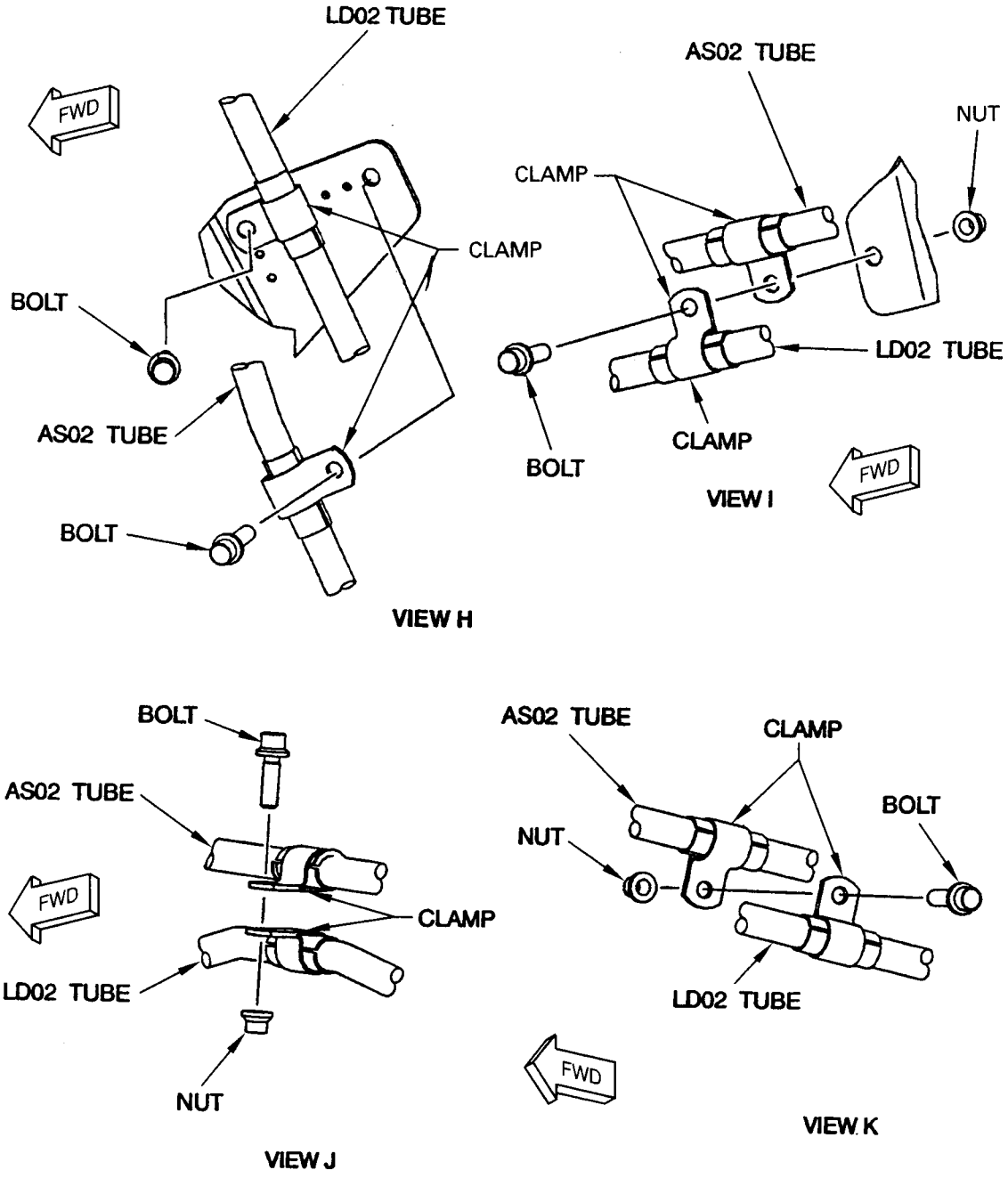
BM5 75 23 07 4 KPMC 00

External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 3/14)
Figure 402

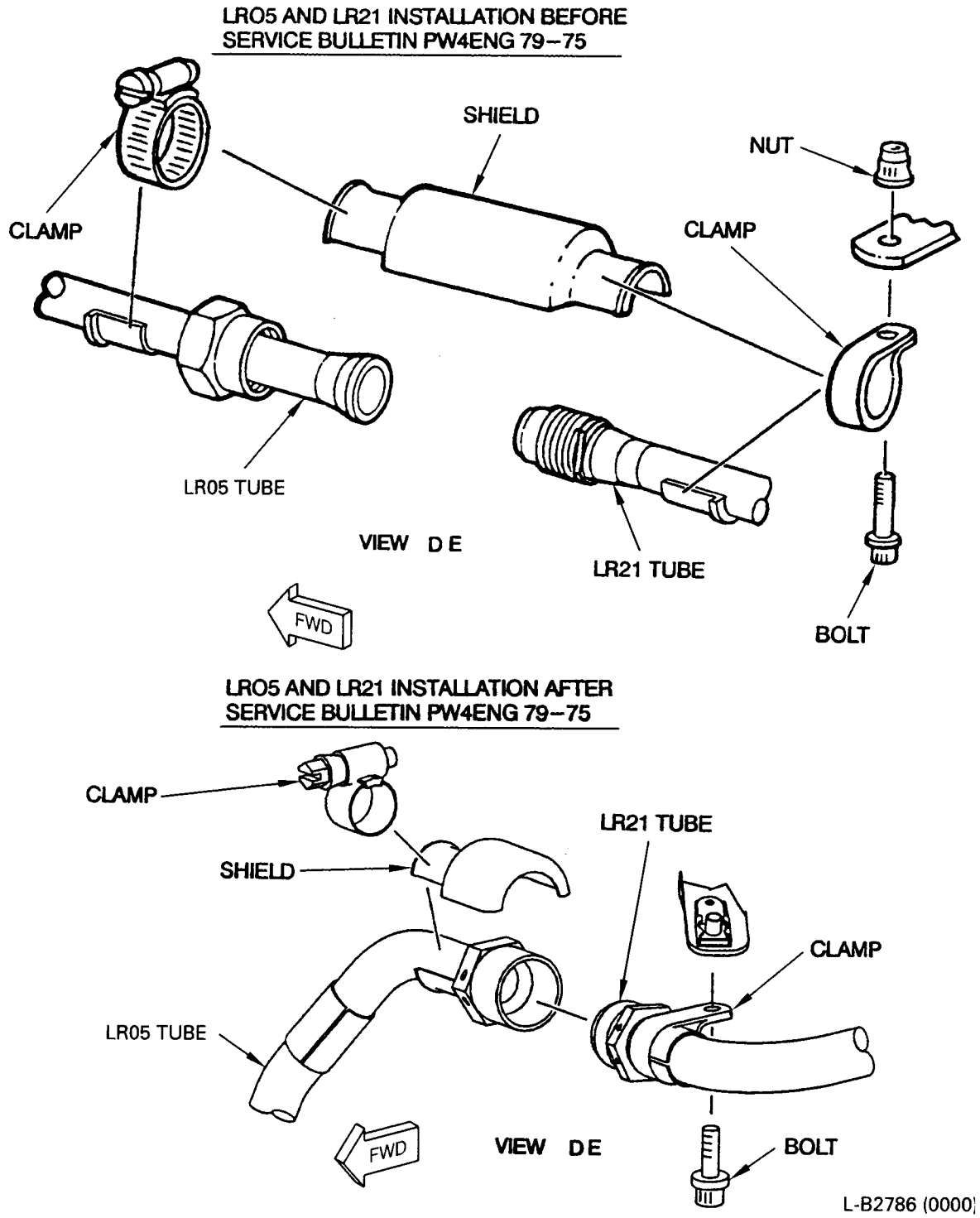


BM5 75 23 07 4 KPMD 00

External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 4/14)
Figure 402

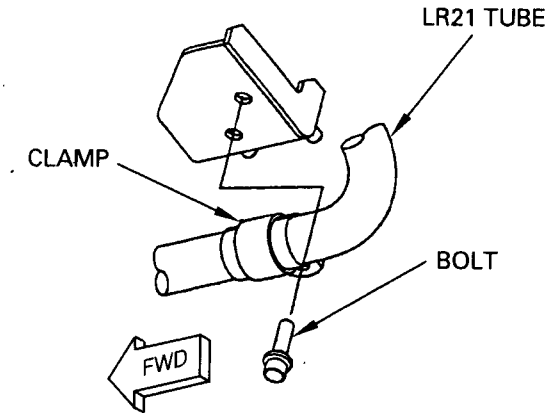


External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 5/14)
Figure 402

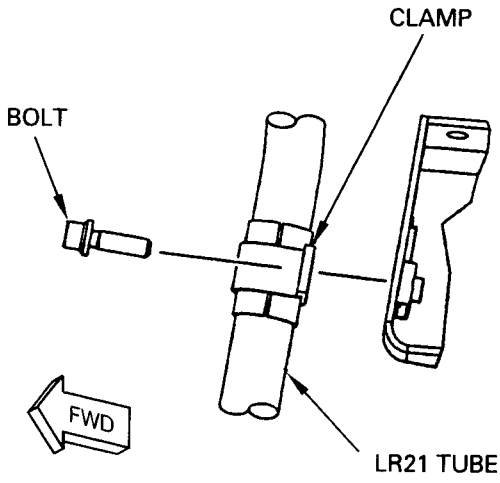


BM5 75 23 07 4 KPMF 00

External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 6/14)
Figure 402



VIEW O

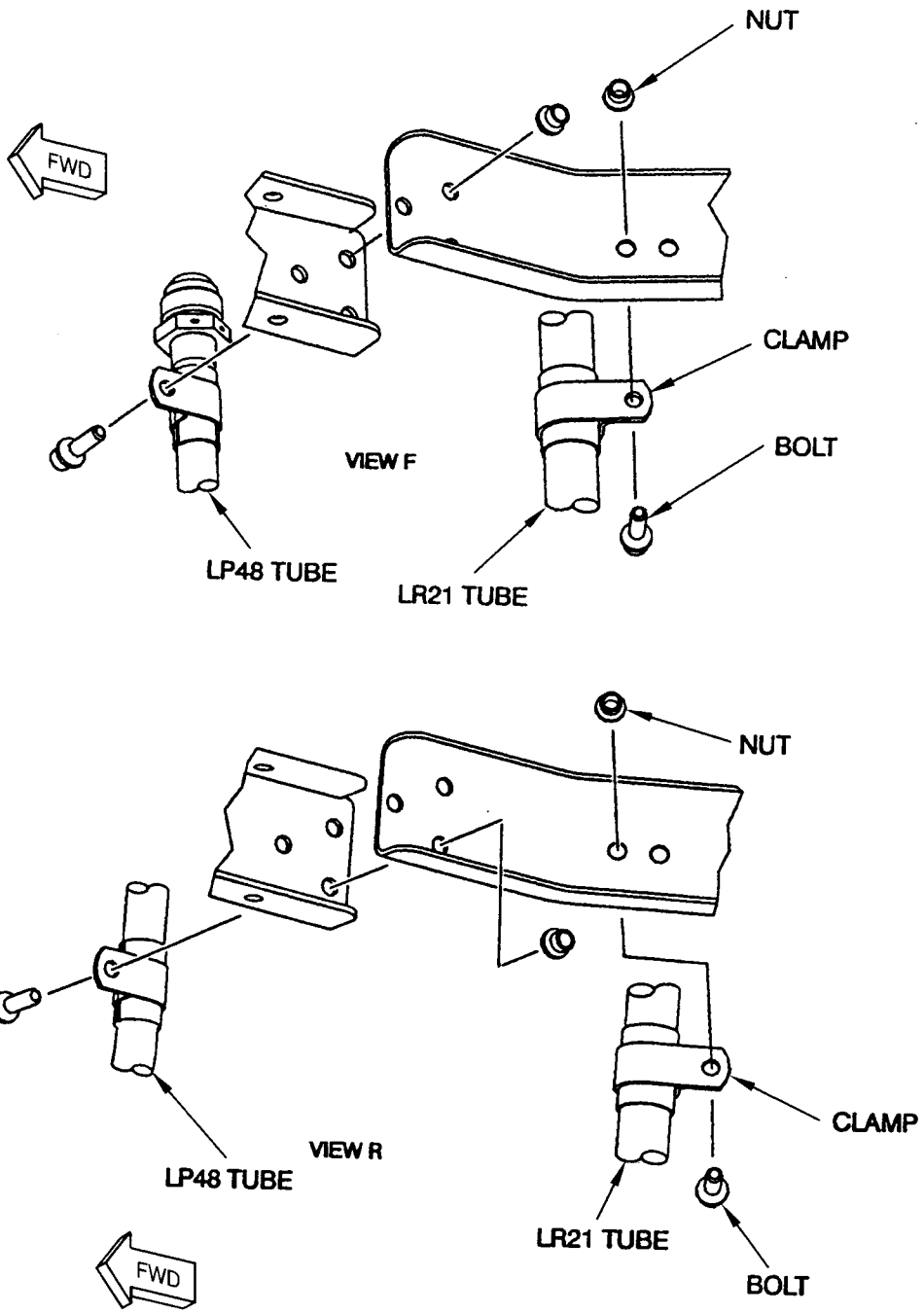


VIEW Q

L-B2787 (0000)

BM5 75 23 07 4 KPMG 00

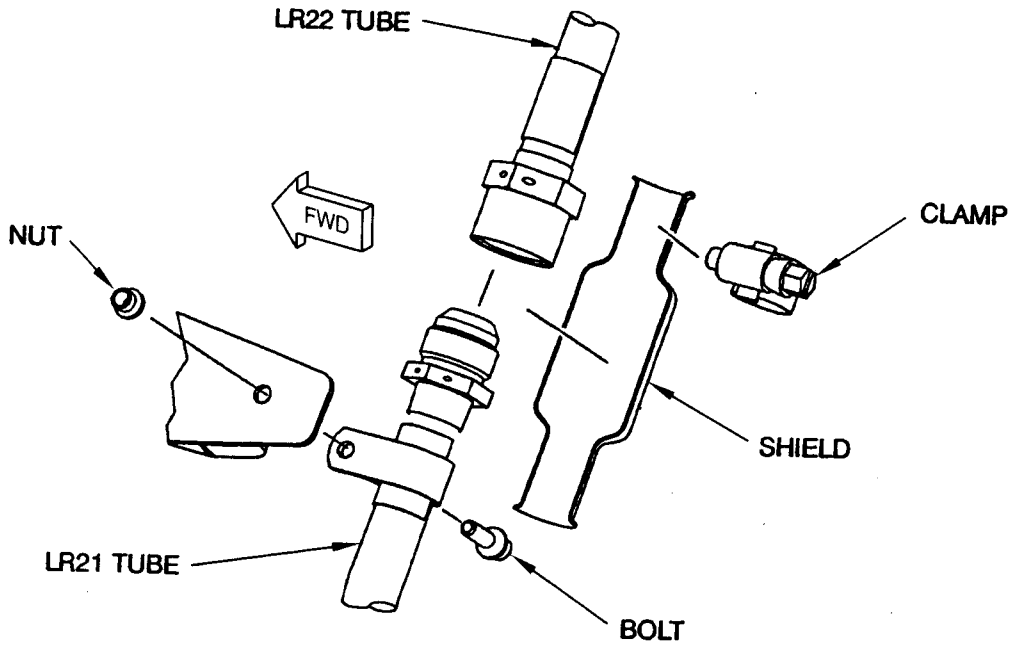
External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 7/14)
Figure 402



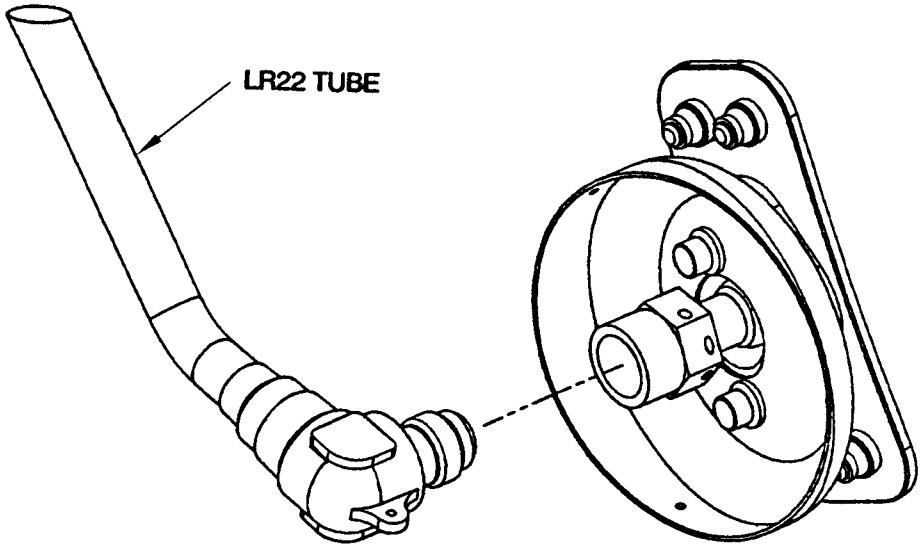
BM5 75 23 07 4 KPMH 00

L-B2788 (0000)

External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 8/14)
Figure 402



VIEW E

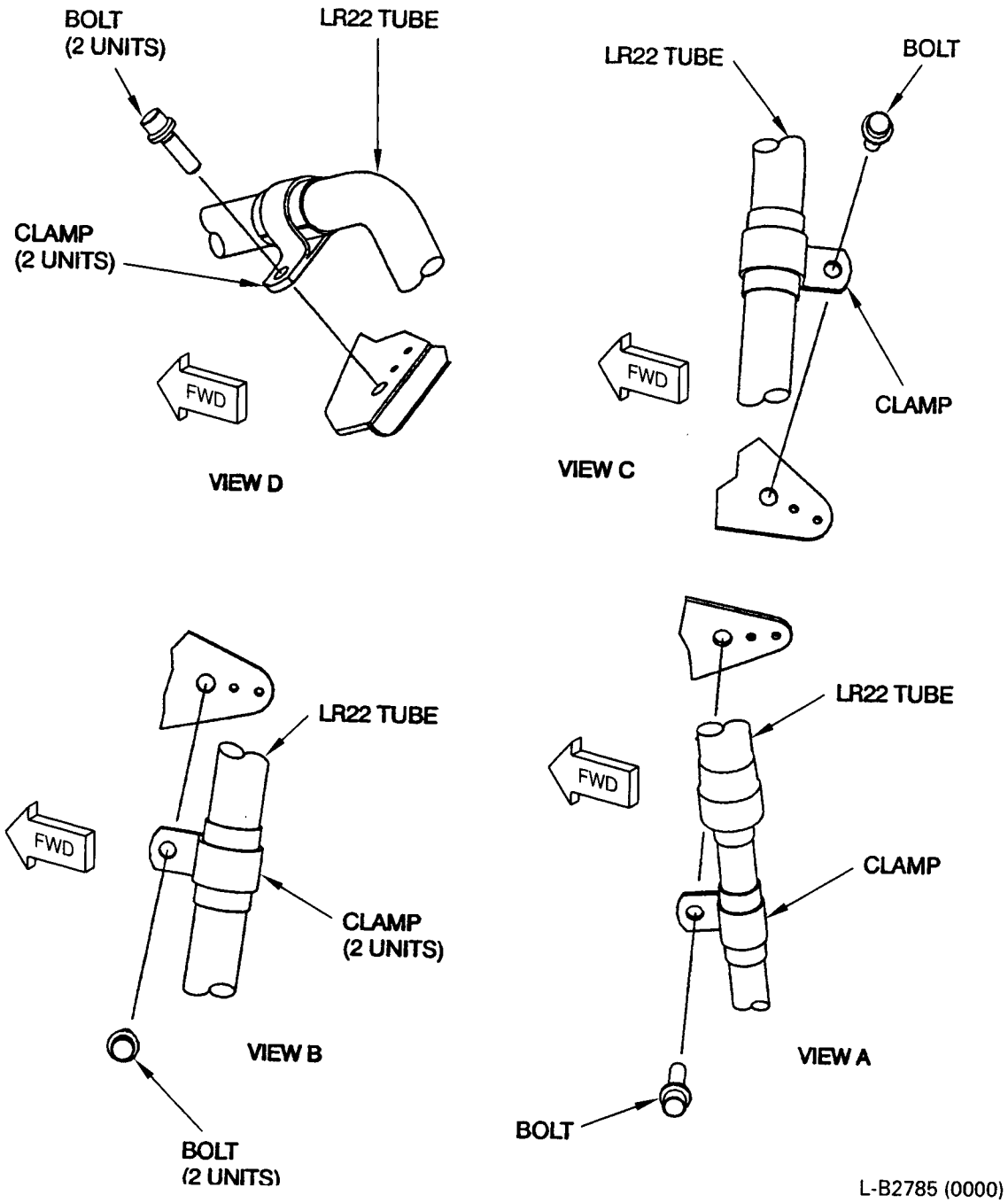


VIEW A P

L-B2784 (0000)

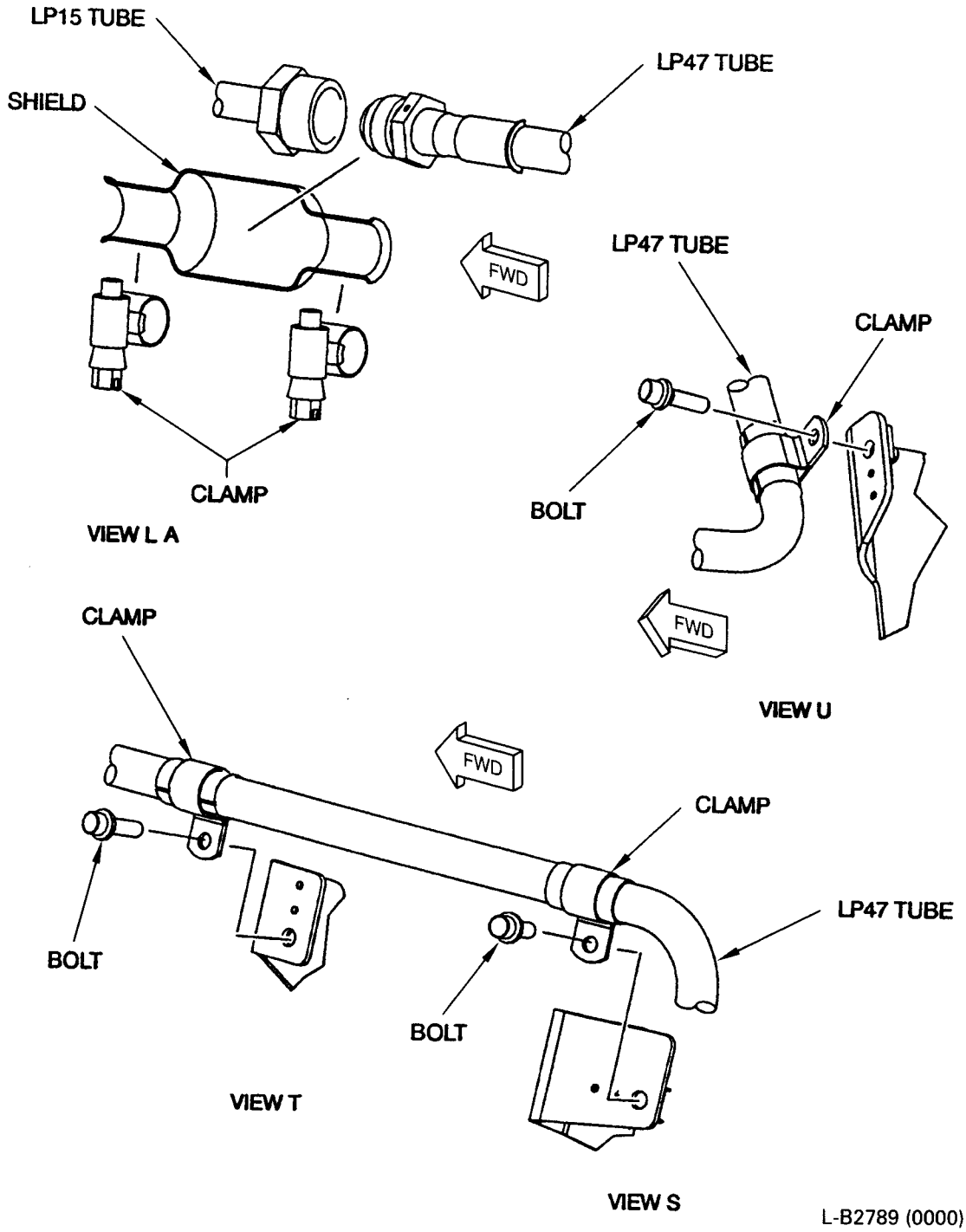
BM5 75 23 07 4 KPMJ 00

External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 9/14)
Figure 402



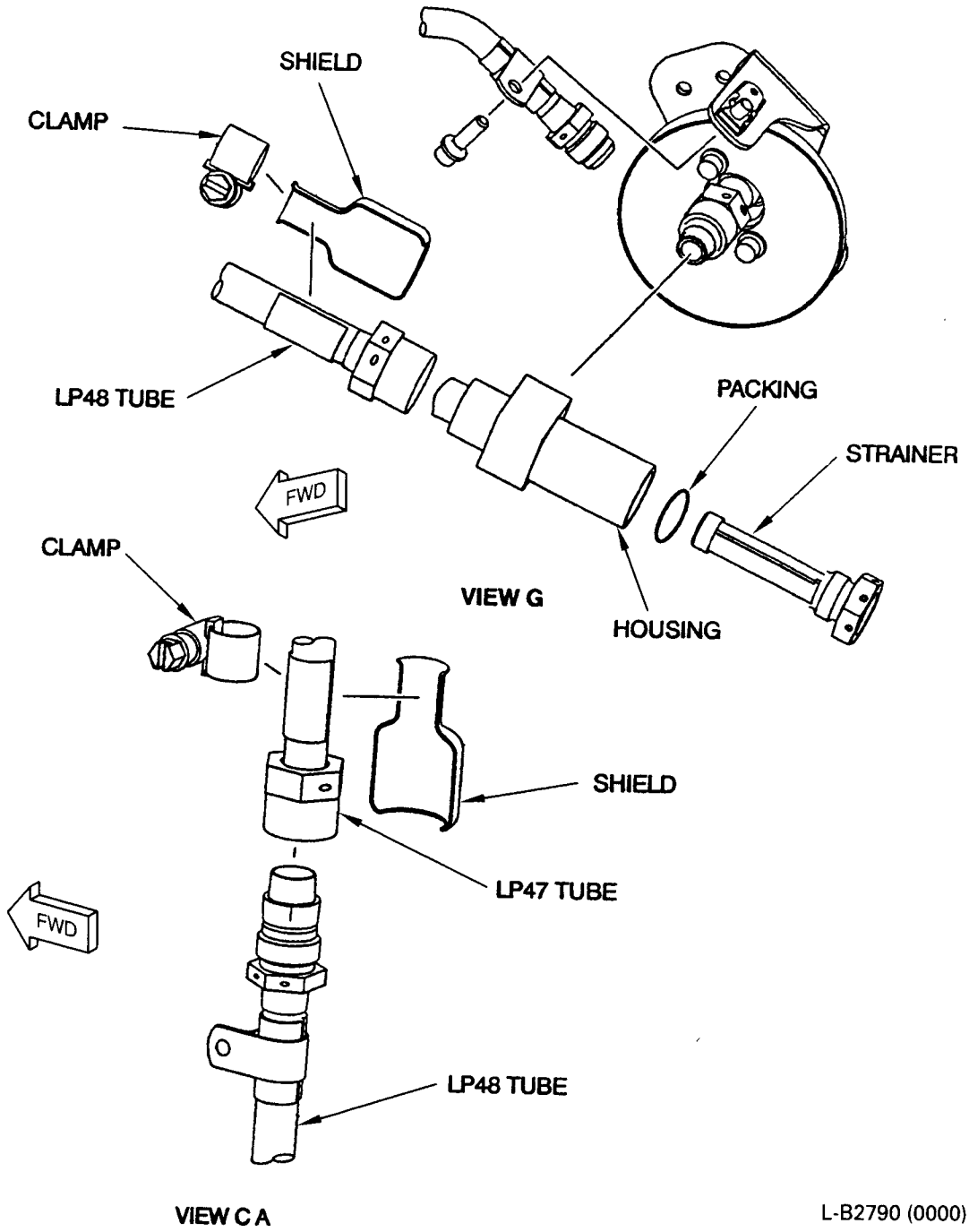
BM5 75 23 07 4 KPMK 00

External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 10/14)
Figure 402



BM5 75 23 07 4 KPML 00

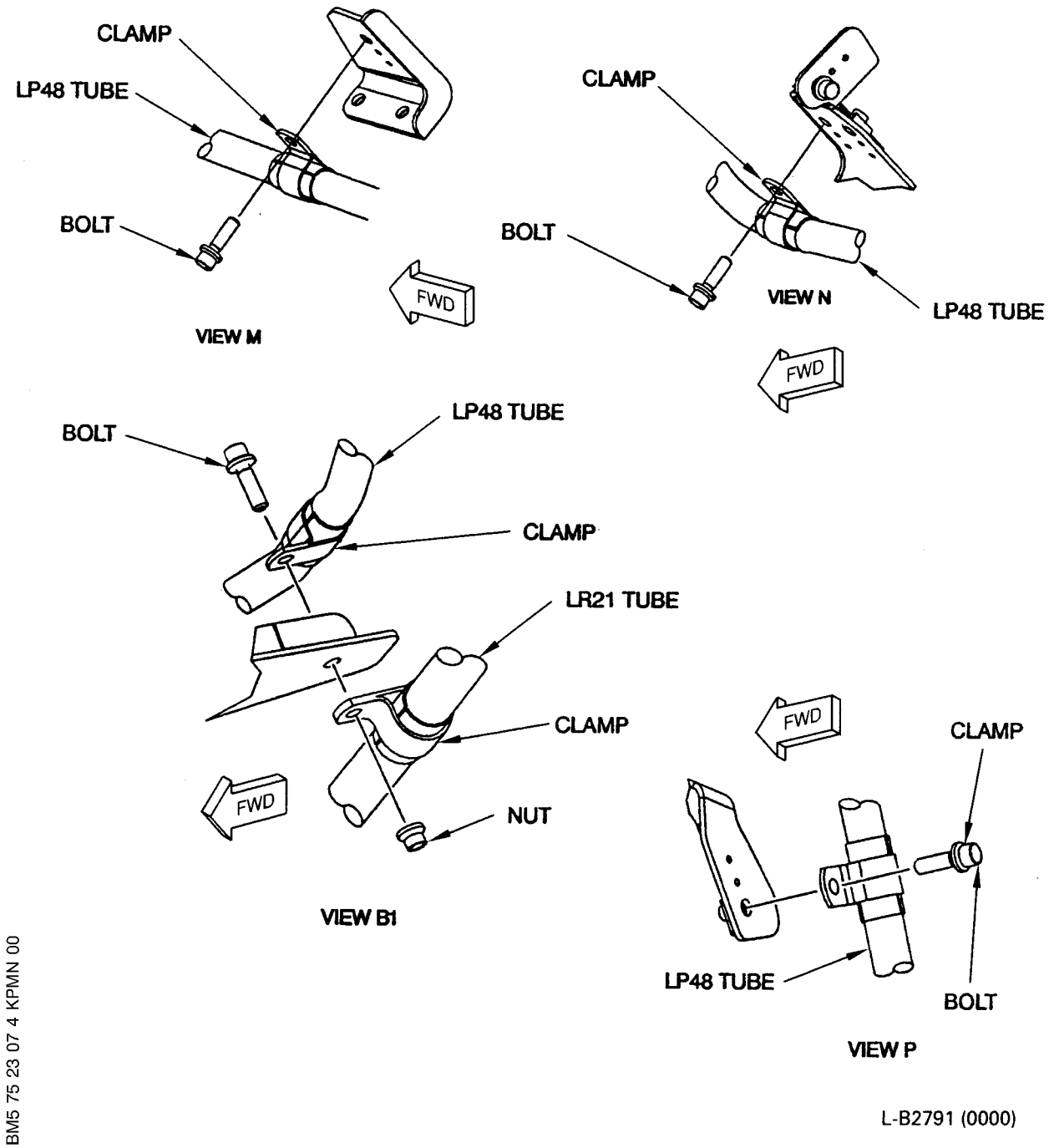
External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 11/14)
Figure 402



L-B2790 (0000)

BM5 75 23 07 4 KPMM 00

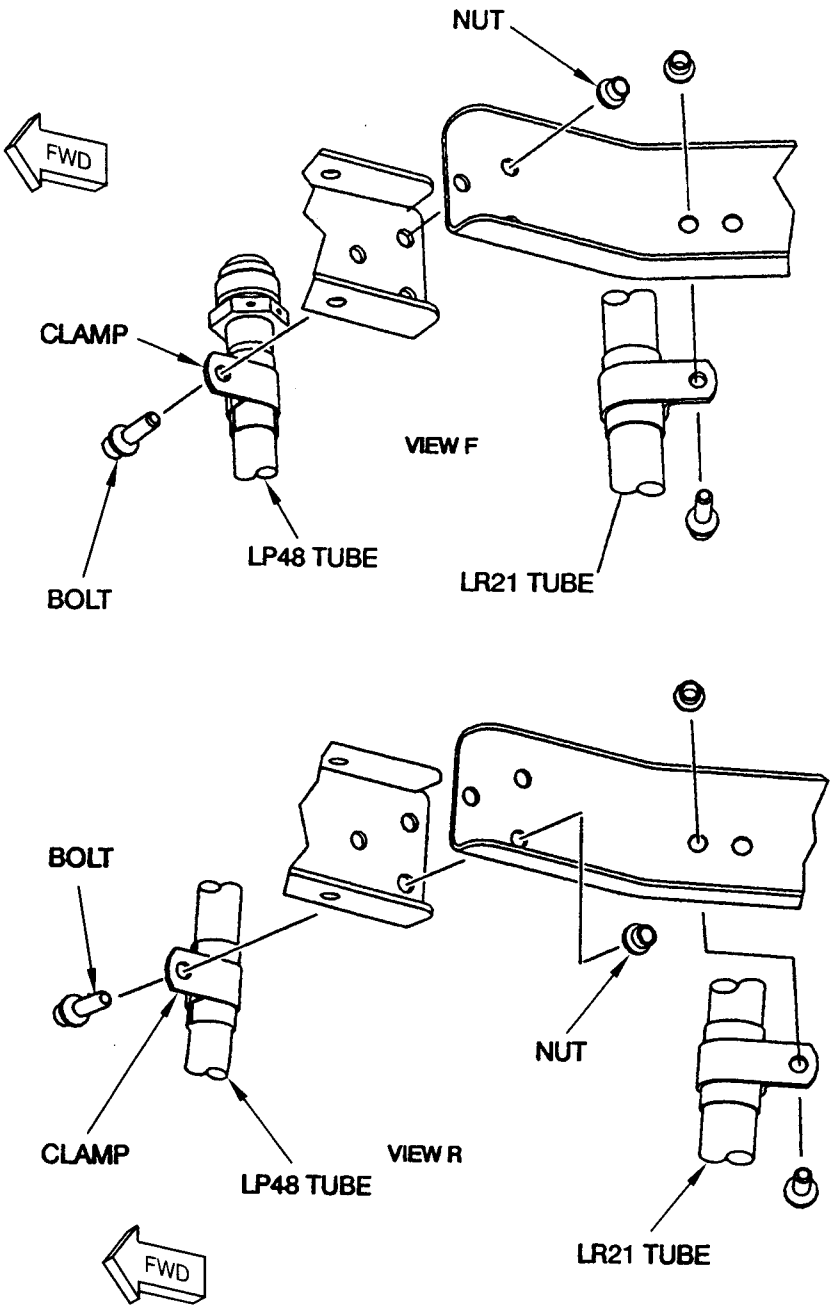
External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 12/14)
Figure 402



BM5 75 23 07 4 KPMN 00

L-B2791 (0000)

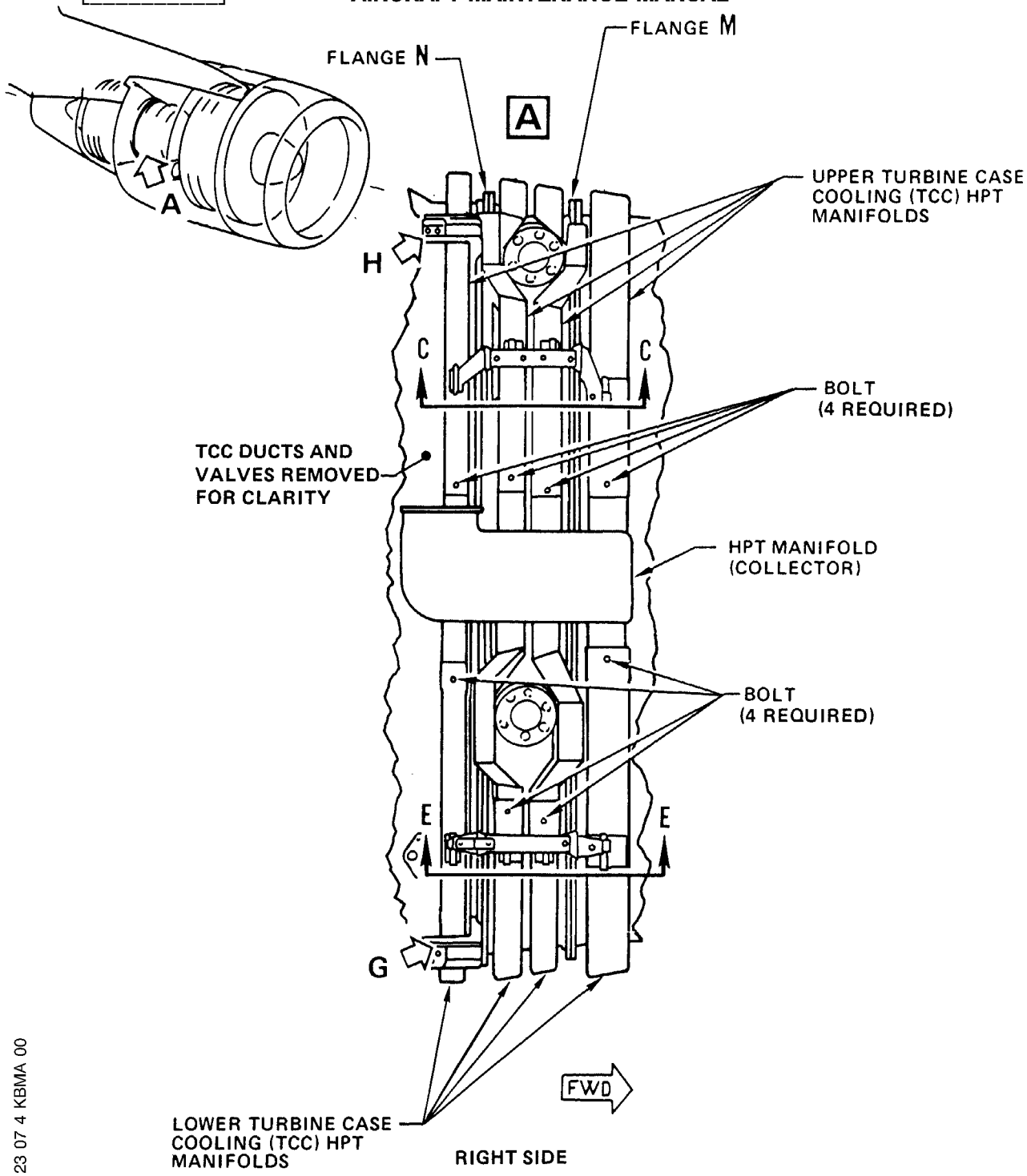
External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 13/14)
Figure 402



BM5 75 23 07 4 KPMP 00

L-B2792 (0000)

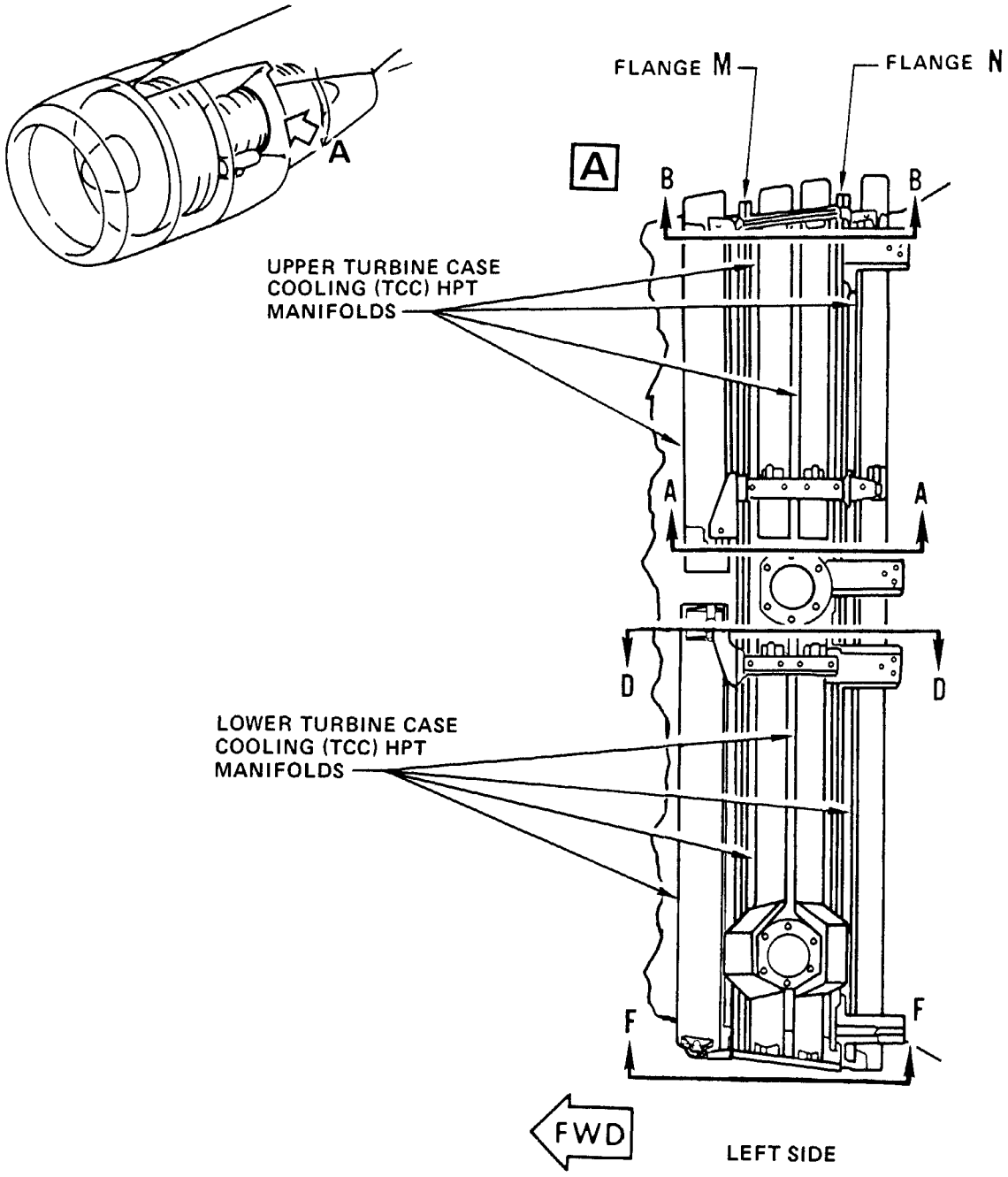
External Plumbing Clipping Views (Post SB PW4ENG 79-76)
(Sheet 14/14)
Figure 402



BM5 75 23 07 4 KBMA 00

L – A3044

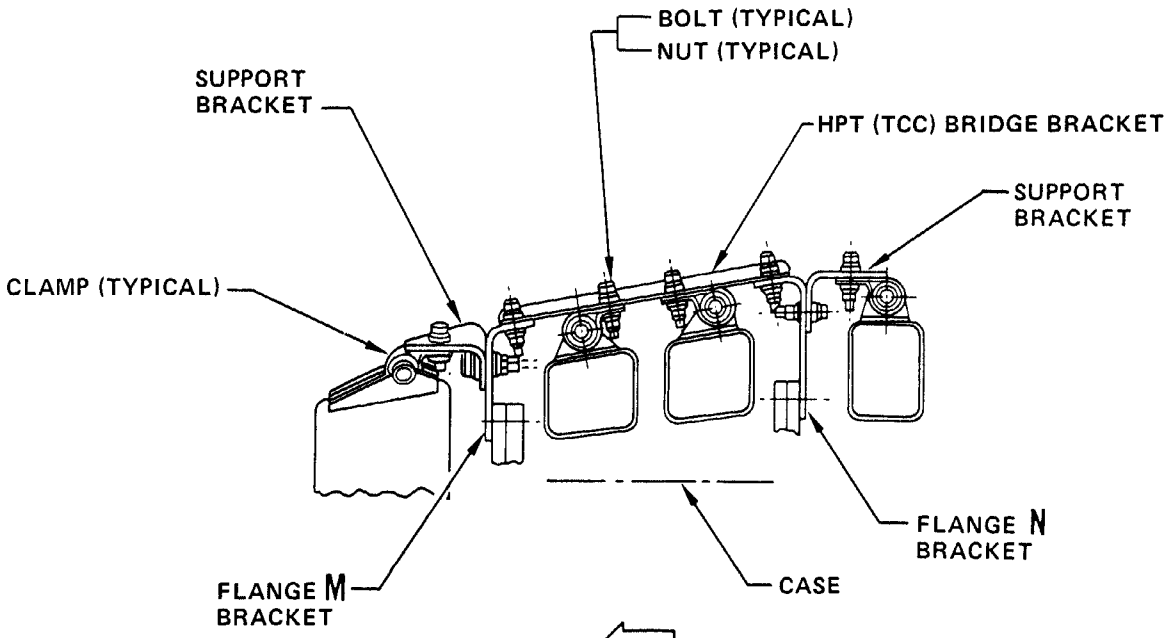
Turbine Case Cooling (TCC) HPT Manifolds
(Sheet 1/6)
Figure 403



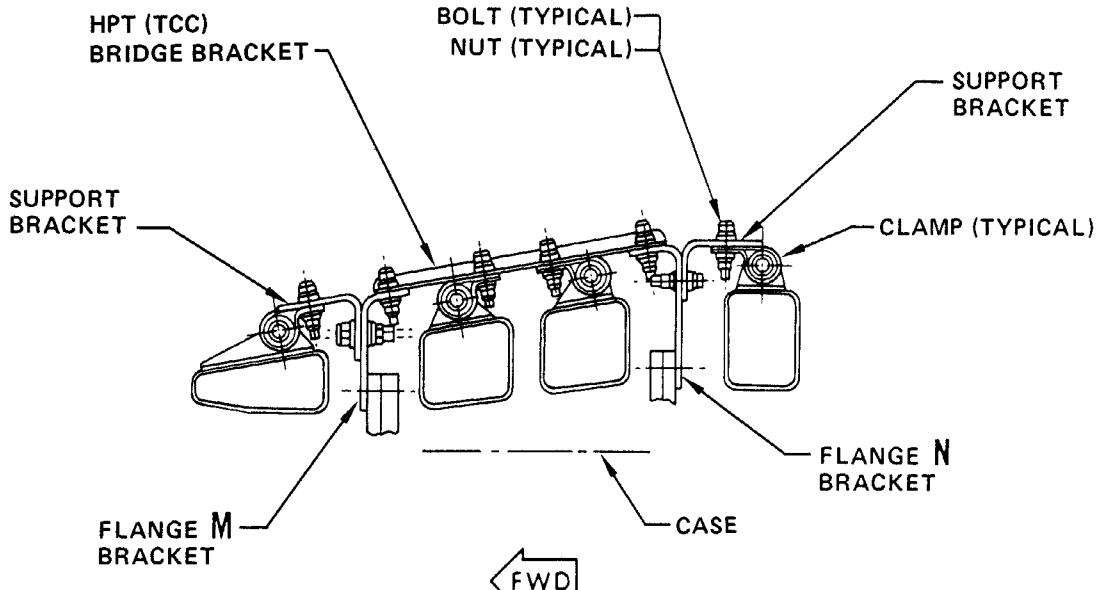
BM5 75 23 07 4 KBMB 00

L – A3045

Turbine Case Cooling (TCC) HPT Manifolds
(Sheet 2/6)
Figure 403



SECTION A-A

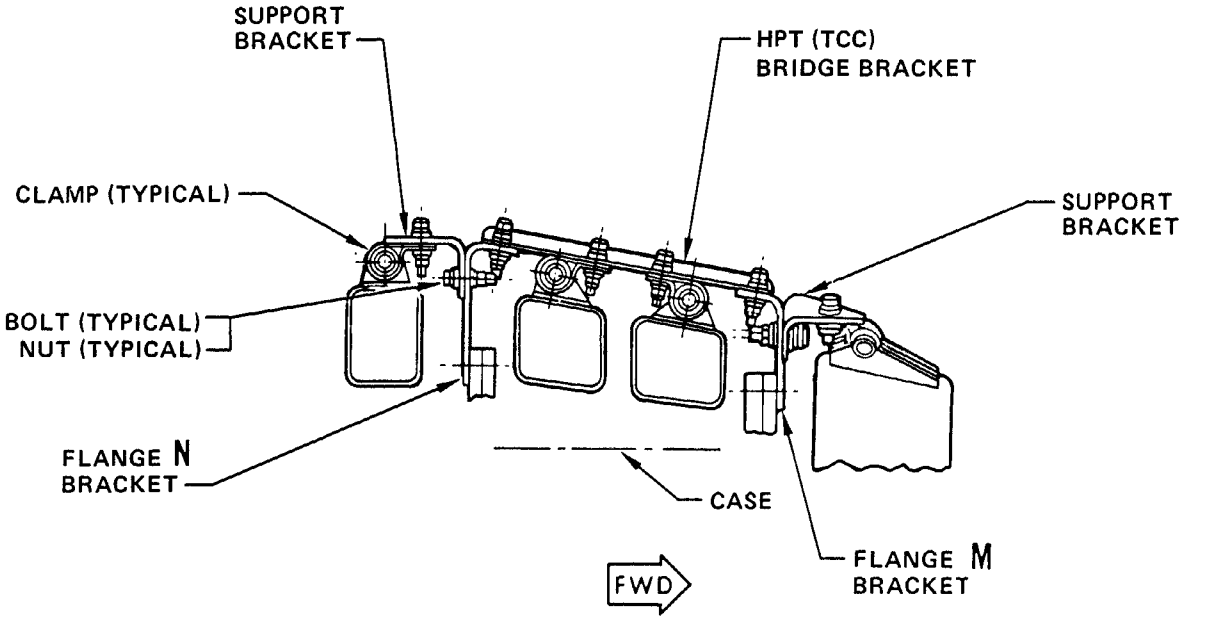


SECTION B-B

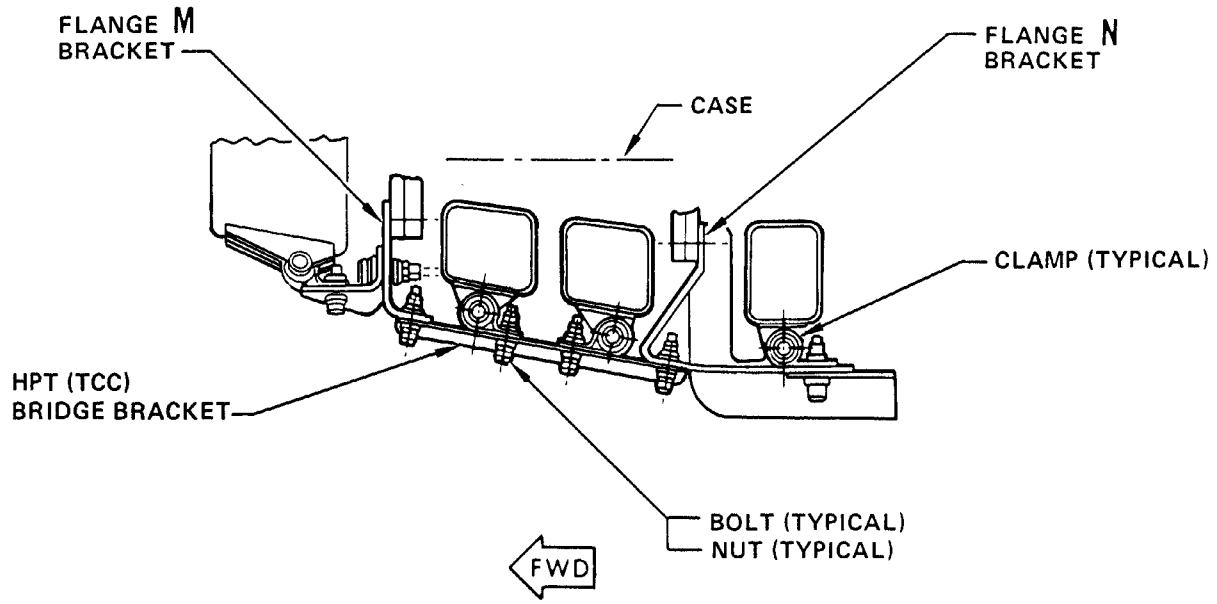
L – A3046

BM5 75 23 07 4 KBMC 00

Turbine Case Cooling (TCC) Manifold Clipping and Brackets
(Sheet 3/6)
Figure 403



SECTION C_C

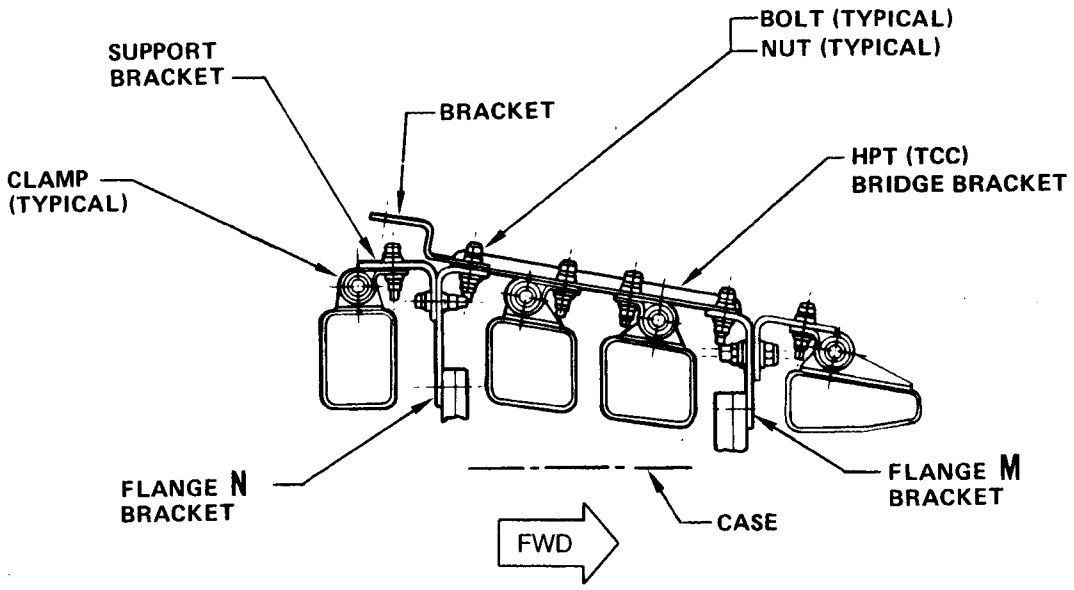


SECTION D_D

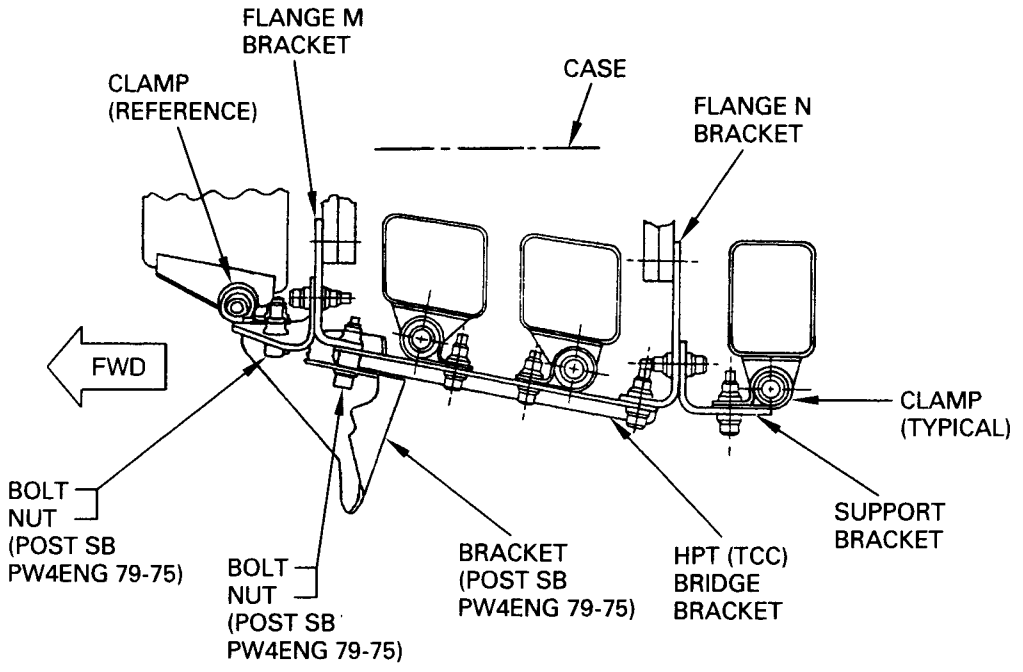
BM5 75 23 07 4 KBMD 00

L – A3047

Turbine Case Cooling (TCC) Manifold Clipping and Brackets
(Sheet 4/6)
Figure 403



VIEW E

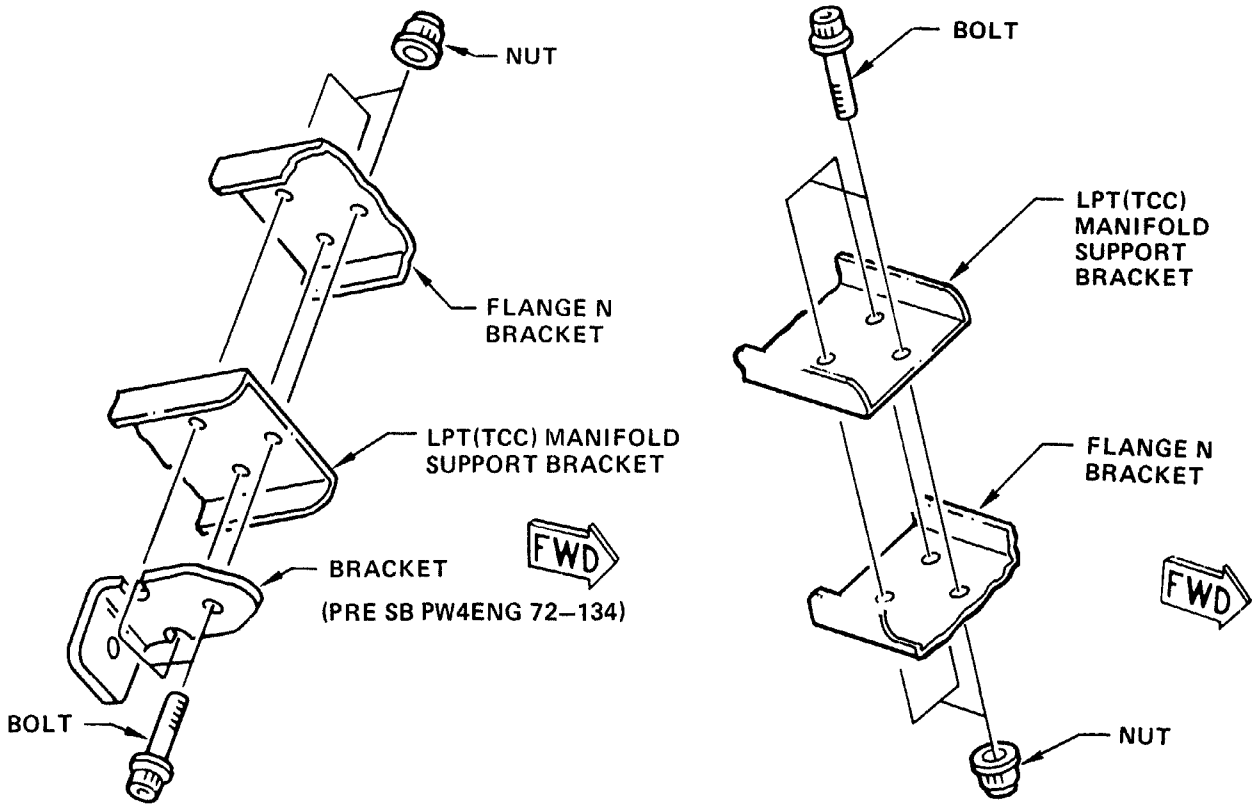


VIEW F

L-B2521 (0000

BM5 75 23 07 4 KBME 00

Turbine Case Cooling (TCC) Manifold Clipping and Brackets
(Sheet 5/6)
Figure 403



BM5 75 23 07 4 KBMF 00

Turbine Case Cooling (TCC) Manifold Clipping and Brackets
(Sheet 6/6)
Figure 403

(4)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

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TURBINE CASE COOLING (TCC) LPT COLLECTOR - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Torque Wrench
C.	Protective Closures
D. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure for PHASE I Configured Engines

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers, and open the right and left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1)Remove bolts securing cooling air manifolds to upper and lower sides of turbine case cooling (TCC) LPT collector.
(2)(Pre SB PW4 ENG 75-50) Remove bolts, spacers, nuts, and clamps that attach the cooling air manifolds to brackets on Flange P at six locations.
(3)(Post SB PW4 ENG 75-50) Remove bolts, nuts and clamps that attach the cooling air manifolds to brackets on flange P at the six locations.
(4)Remove bolts and nuts securing cooling air manifold brackets to brackets on Flange N and boss on case.
(5)Disengage lower cooling manifolds from LPT collector by sliding downward and away from collector.
(6)Disengage upper cooling manifolds from LPT collector by sliding upward and away from collector.
(7)(Post SB PW4 ENG 75-53) Remove the upper and lower cover assemblies from the rear (No. 7) of the manifold (collector).
(8)Remove bolts securing collector to support bracket and LPT cooling air valve flange.
(9)Remove bolts and clamps securing inboard bracket on collector to bracket on Flange N.
(10)Remove bolts, nuts, and clamps securing rear of LPT collector to brackets on Flange P and remove collector from engine.
(11)Install protective closures.

C. Installation
(1)Remove protective closures.
(2)Position turbine case cooling (TCC) LPT collector to support bracket and LPT cooling air valve using bolts, threads lubricated with Material No.P03-001, and nuts handtight only.
(3)Install clamps to front collector mount and secure to bracket on Flange N

with bolts, threads lubricated with Material No.P03-001 handtight only.
(4)Install clamps to rear collector mounts and secure to brackets on Flange P with bolts, threads lubricated with Material No.P03-001 and nuts handtight only.
(5)Slide lower cooling air manifolds upward and engage with collector tubes. Secure manifolds with bolts, threads lubricated with Material No.P03-001 handtight only.
(6)Slide upper cooling air manifolds downward toward collector and engage with tubes on collector. Secure manifolds with bolts, threads lubricated with Material No.P03-001 handtight only.
(7)(Post SB PW4 ENG 75-53) Install cover assemblies on the upper and lower rear tubes (No.7) of the manifold (collector).
Attach the covers to the tubes with bolts, threads lubricated with Material No. P03-001 and tighten by hand.
(8)Install bolts, threads lubricated with Material No.P03-001 and nuts to secure cooling air manifold brackets to brackets on Flange N and bracket on LPT case handtight only.
(9)(Pre SB PW4 ENG 75-50) Install the clamps to the rear mounts of the cooling air manifold brackets. Attach the manifolds to the brackets on flange P with bolts, threads lubricated with Material No. P03-001, spacers, and nuts tightened by hand.
(10)(Post SB PW4 ENG 75-50) Install the clamps to the rear mounts of the cooling air manifold brackets. Attach the manifolds to the brackets on flange P with bolts, threads lubricated with Material No. P03-001, and nuts tightened by hand.
(11)Install clamps to rear mounts of cooling air manifold brackets and secure to brackets on Flange P with bolts, threads lubricated with Material No.P03-001, spacers, and nuts handtight only.
(12)Torque all bolts, previously installed, as follows :
(a)TORQUE bolts securing collector to support bracket and valve flange to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
(b)TORQUE bolts securing front collector mount to Flange N bracket to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(c)TORQUE bolts securing collector rear mount clamps to Flange P brackets to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(d)TORQUE all upper and lower cooling air manifolds retaining bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(e)(Post SB PW4 ENG 75-53) TORQUE upper and lower bolts that attach the cover assemblies to rear of collector to between 36 and 40 lbf.in. (0.41 and 0.45 m. daN).
(f)TORQUE all bolts on forward mount brackets to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(g)TORQUE all bolts securing clamps on rear mounts to brackets on Flange P to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close right thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

2. Procedure for PHASE III Configured Engines

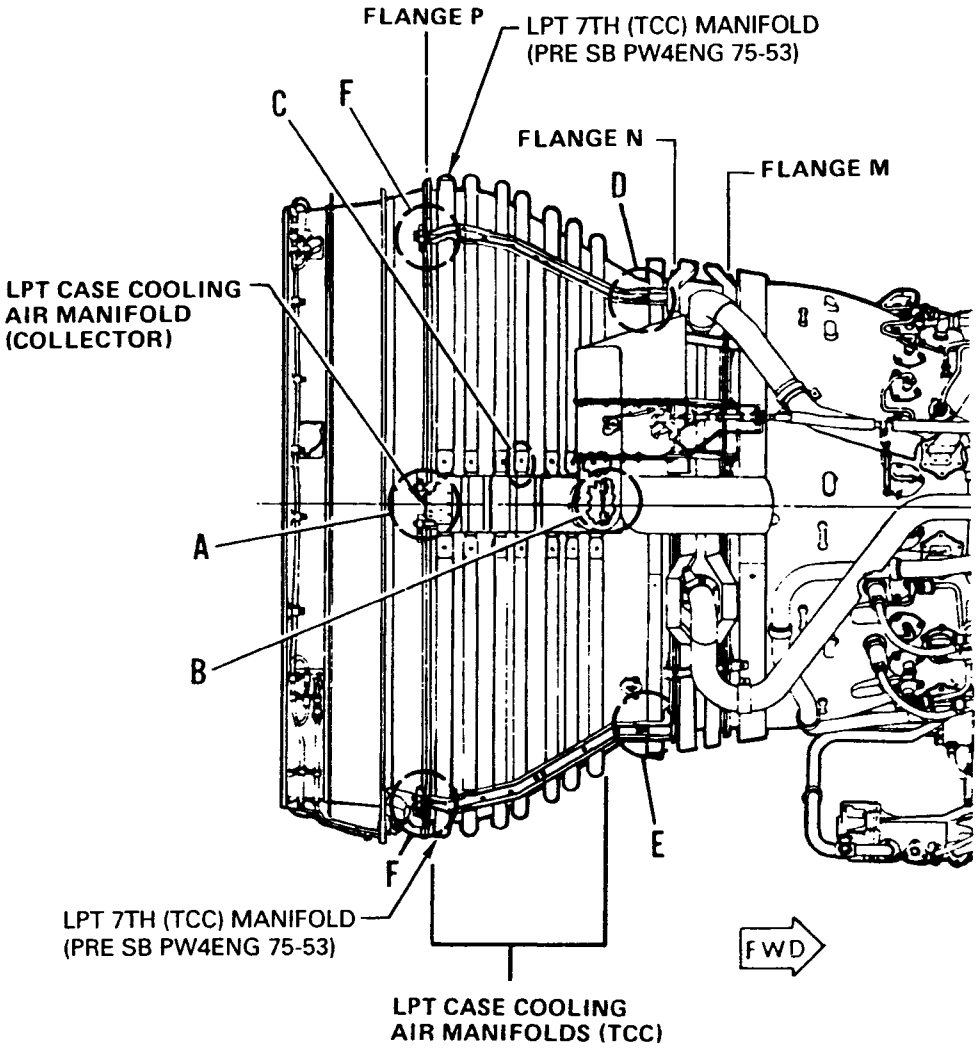
A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers, and open the right and left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 402)
(1)Remove the bolts which attach the cooling air manifolds to the upper and lower sides of the turbine case cooling (TCC) LPT collector.
(2)Remove the bolts, nuts and clamps that attach the cooling air manifolds to the brackets of flange P at the six locations.
(3)Remove the bolts and nuts that attach the cooling air manifold brackets to the brackets on flange N and the boss on the LPT case.
(4)Disengage the lower cooling manifolds from the LPT collector. Move the cooling manifolds down and away from the collector.
(5)Disengage the upper cooling manifolds from the LPT collector. Move the cooling manifolds up and away from the collector.
(6)Remove the bolts that attach the collector to the support bracket and the LPT cooling air valve flange.
(7)Remove the bolts and clamps that attach the inboard bracket on the collector to the bracket on flange N.
(8)Remove the bolts, nuts, and clamps that attach the rear of the LPT collector to the brackets on flange P and remove the collector from engine.
(9)Install protective closures.

C. Installation
(1)Remove the protective closures.
(2)Install the turbine case cooling (TCC) LPT collector to the support bracket and the LPT cooling air valve with bolts, threads lubricated with Material No.P03-001, and nuts handtight only.
(3)Install clamps to the front collector mount and attach to the bracket on flange N with bolts, threads lubricated with Material No.P03-001 handtight only.
(4)Install the clamps to the rear collector mounts and attach to the brackets on flange P with bolts, threads lubricated with Material No.P03-001 and nuts handtight only.
(5)Move the lower cooling air manifolds up and engage them with the collector tubes. Attach the manifolds with bolts, threads lubricated with Material No.P03-001 handtight only.
(6)Move the upper cooling air manifolds down to engage with the tubes on the collector. Attach the manifolds with bolts, threads lubricated with Material No.P03-001 handtight only.

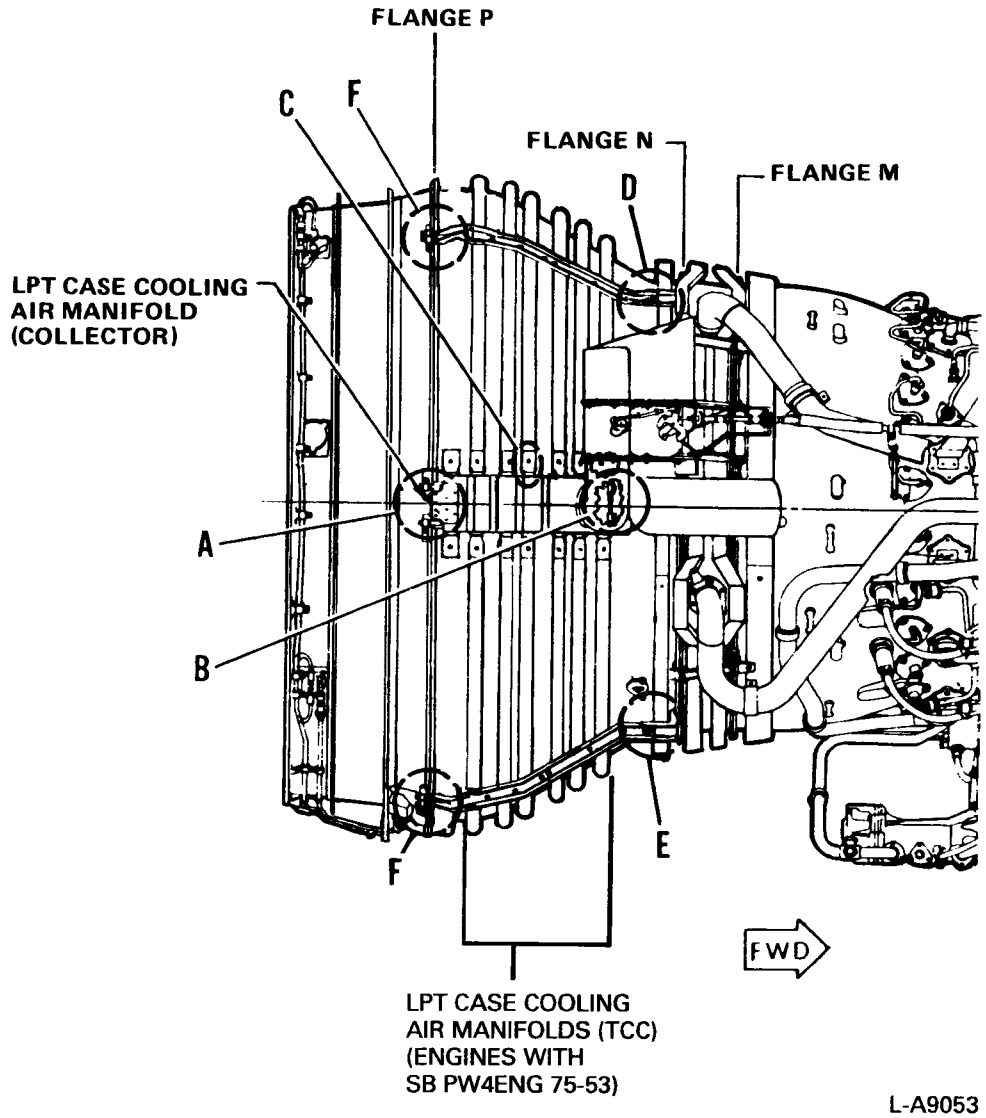
(7)Install the bolts, threads lubricated with Material No.P03-001, and the nuts to attach the cooling air manifold brackets to the brackets on flange N and the bracket on the LPT case handtight only.
(8)Install the clamps to the rear mounts of the cooling air manifold brackets. Attach the manifolds to the brackets on flange P with bolts, threads lubricated with Material No.P03-001 and nuts tightened by hand.
(9)TORQUE all the bolts, installed before, as follows :
(a)TORQUE the bolts which attach the collector to the support bracket and valve flange to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
(b)TORQUE the bolts which attach the front collector mount to the flange N bracket to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(c)TORQUE the bolts that attach the collector rear mount clamps to the flange P brackets to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(d)TORQUE all the upper and lower cooling air manifold retaining bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(e)TORQUE all the bolts on the forward mount brackets to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(f)TORQUE all the bolts which attach the clamps on the rear mounts to the brackets on flange P to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close right and left thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



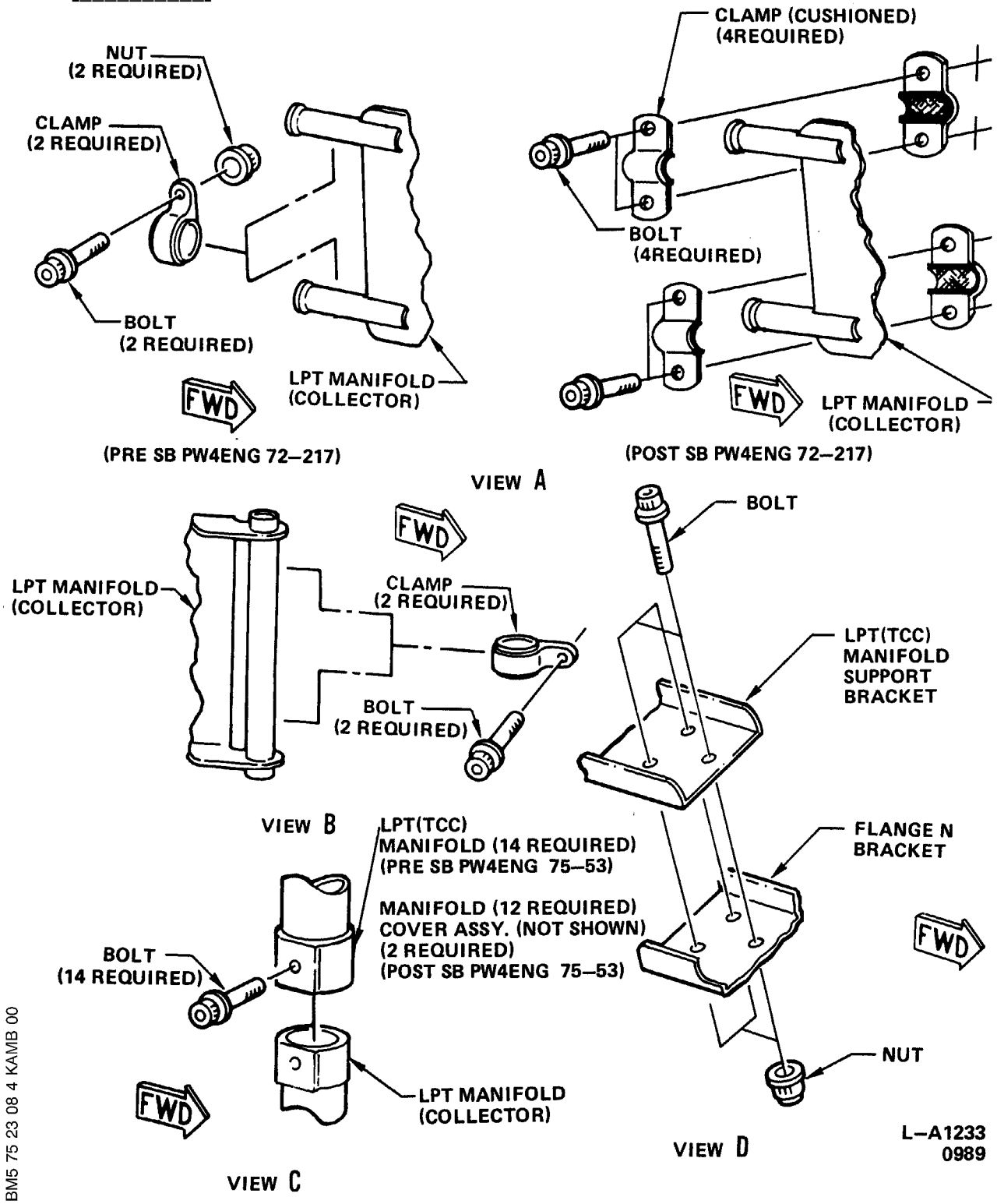
BM5 75 23 08 4 KAMA 00

Turbine Case Cooling (TCC)
LPT Collector for PHASE I Engine Configuration (Sheet 1/7)
Figure 401

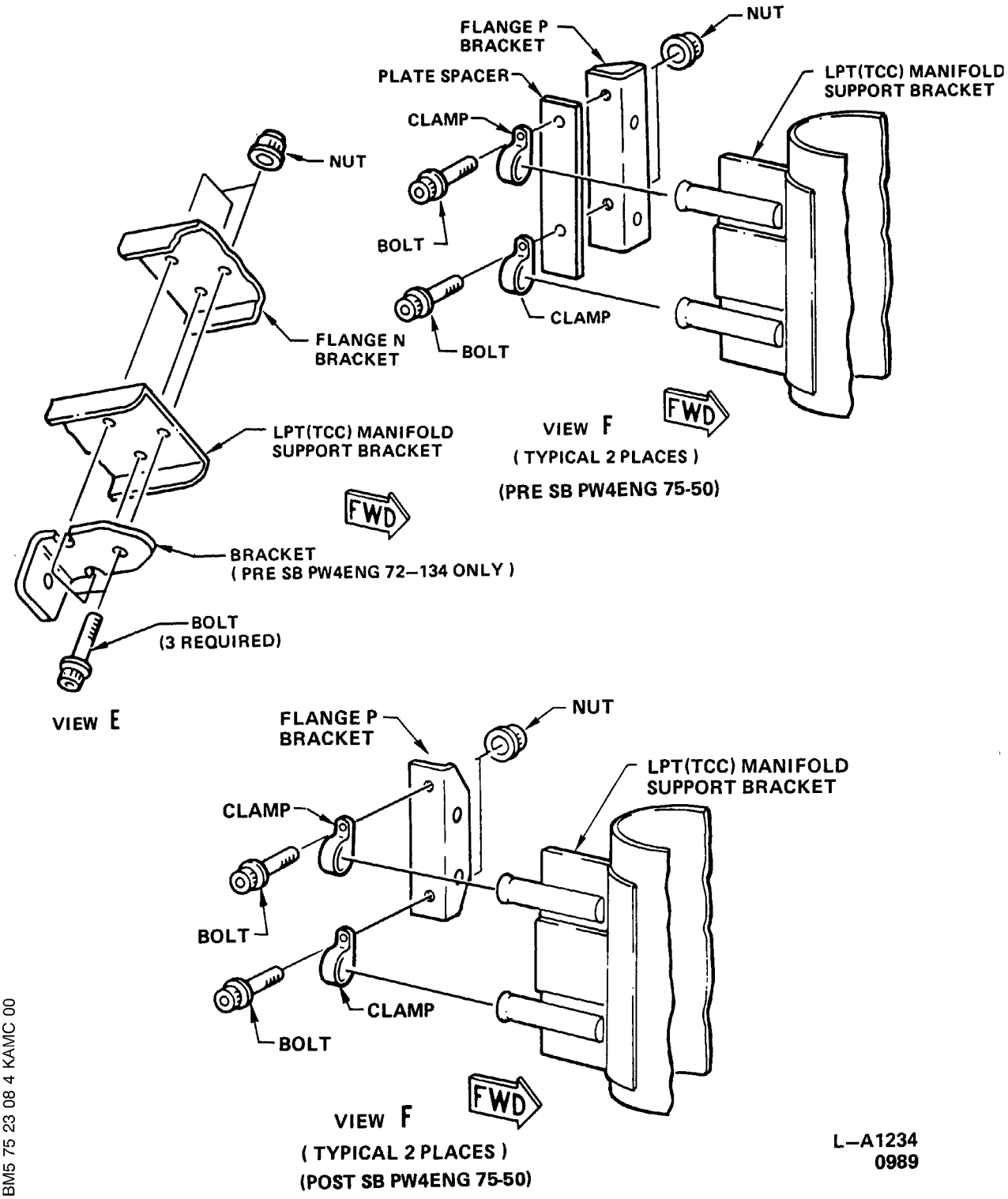


BM5 75 23 08 4 KAMP 00

Turbine Case Cooling (TCC)
LPT Collector for PHASE I Engine Configuration (Sheet 2/7)
Figure 401

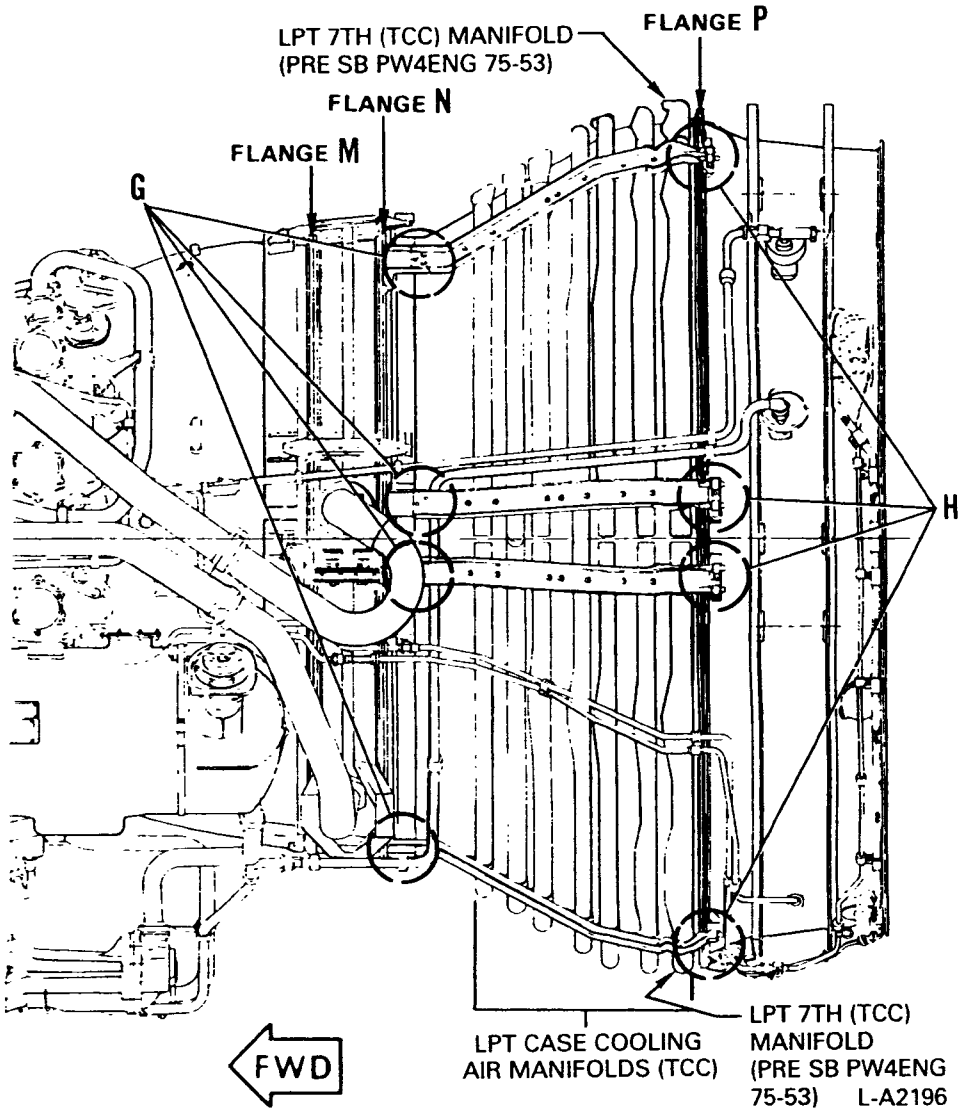


Turbine Case Cooling (TCC)
LPT Collector for PHASE I Engine Configuration (Sheet 3/7)
Figure 401



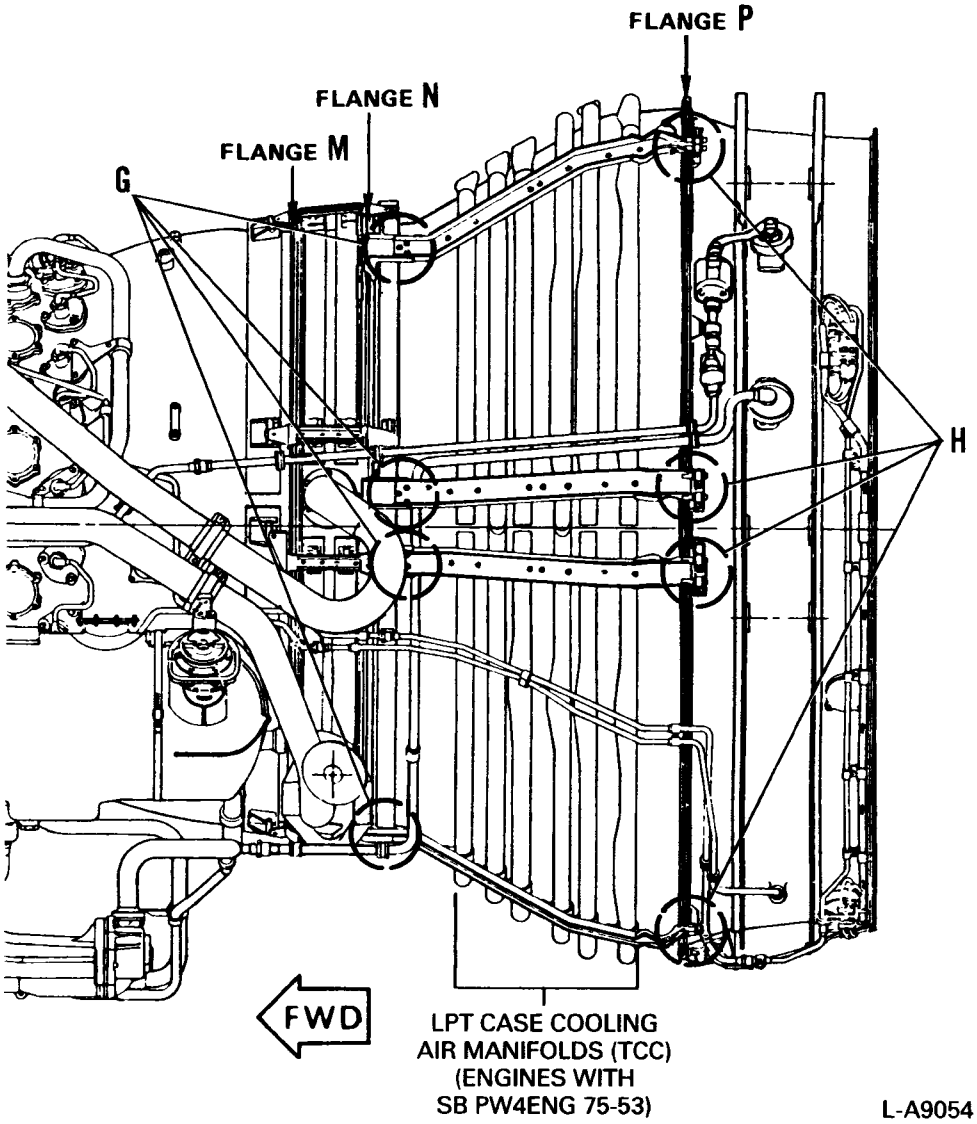
BM5 75 23 08 4 KAMC 00

Turbine Case Cooling (TCC)
LPT Collector for PHASE I Engine Configuration (Sheet 4/7)
Figure 401



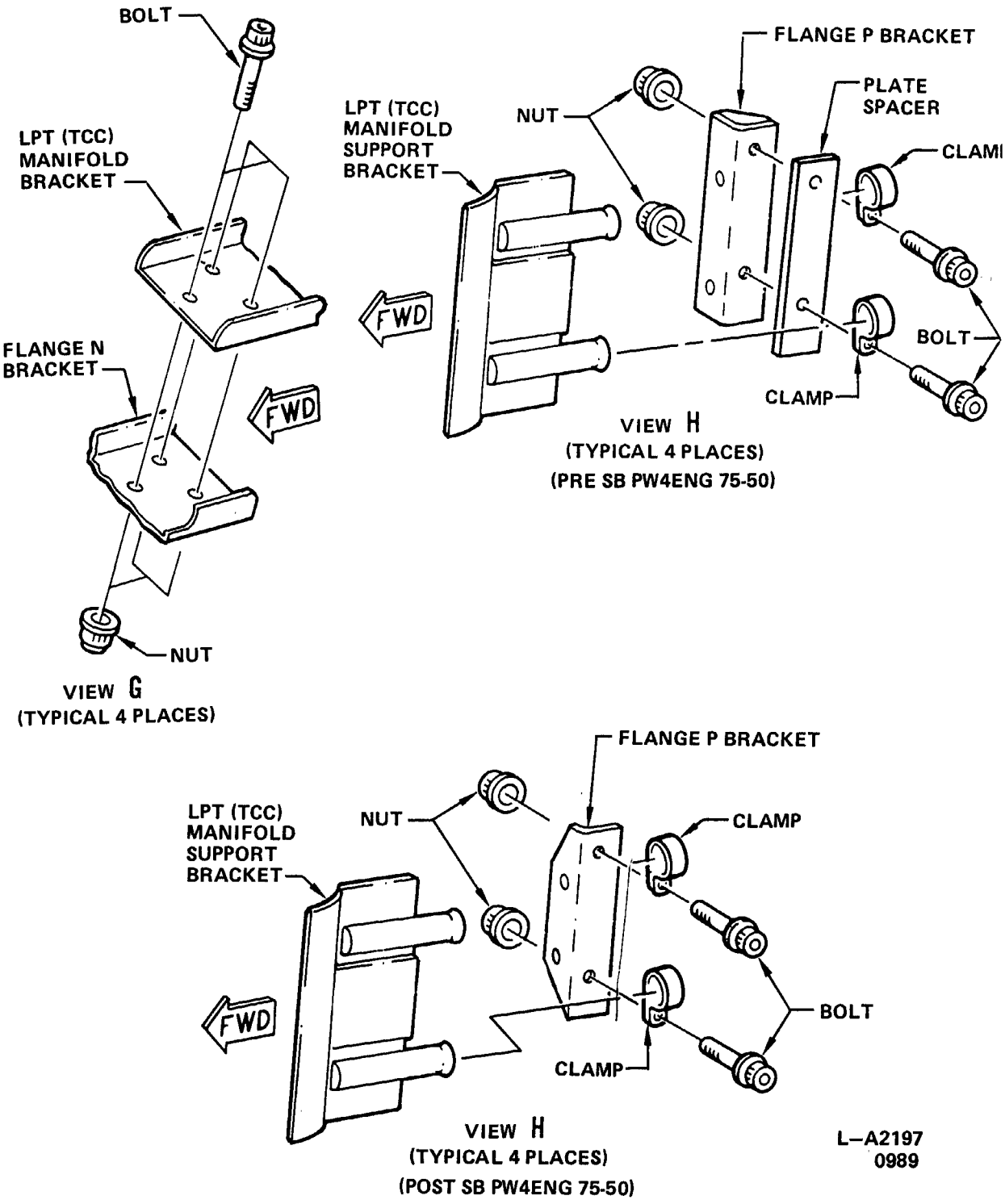
BM5 75 23 08 4 KAMD 00

Turbine Case Cooling (TCC)
LPT Collector for PHASE I Engine Configuration (Sheet 5/7)
Figure 401



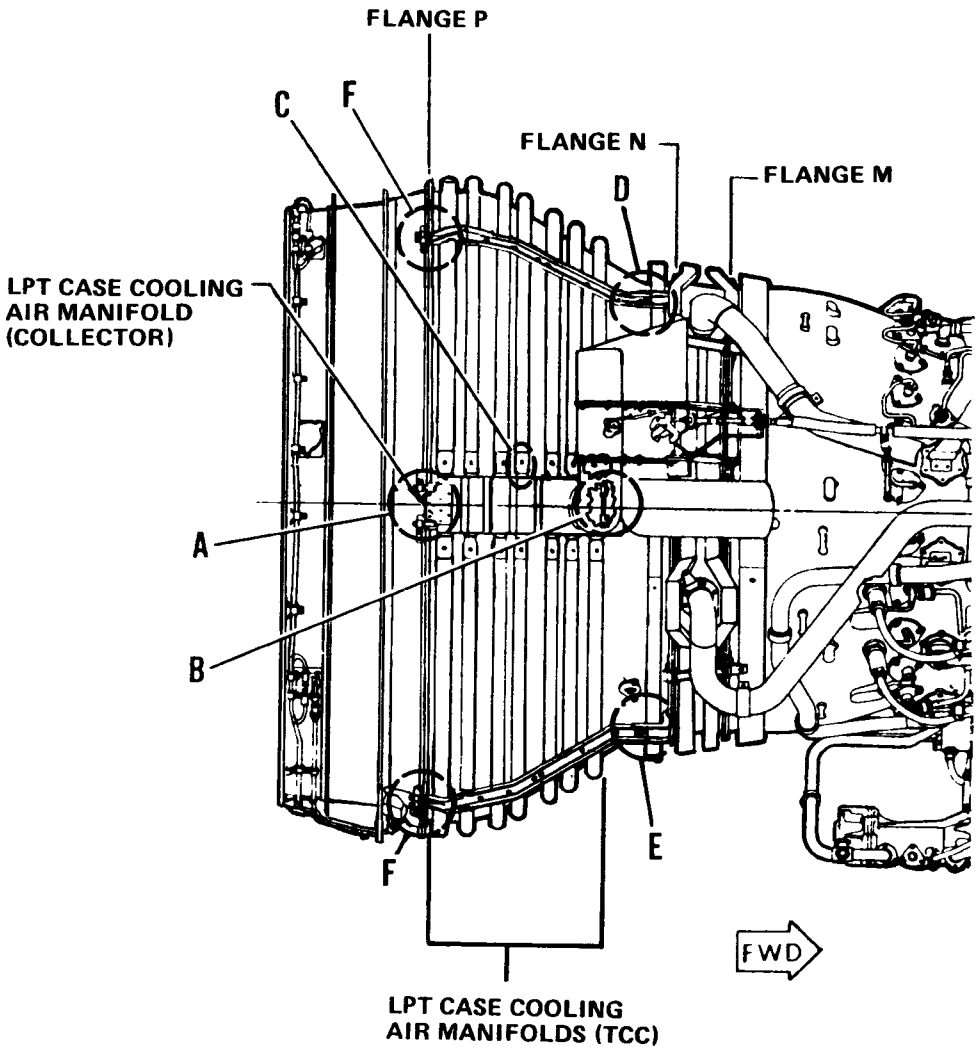
BM5 75 23 08 4 KAMT 00

Turbine Case Cooling (TCC)
LPT Collector for PHASE I Engine Configuration (Sheet 6/7)
Figure 401



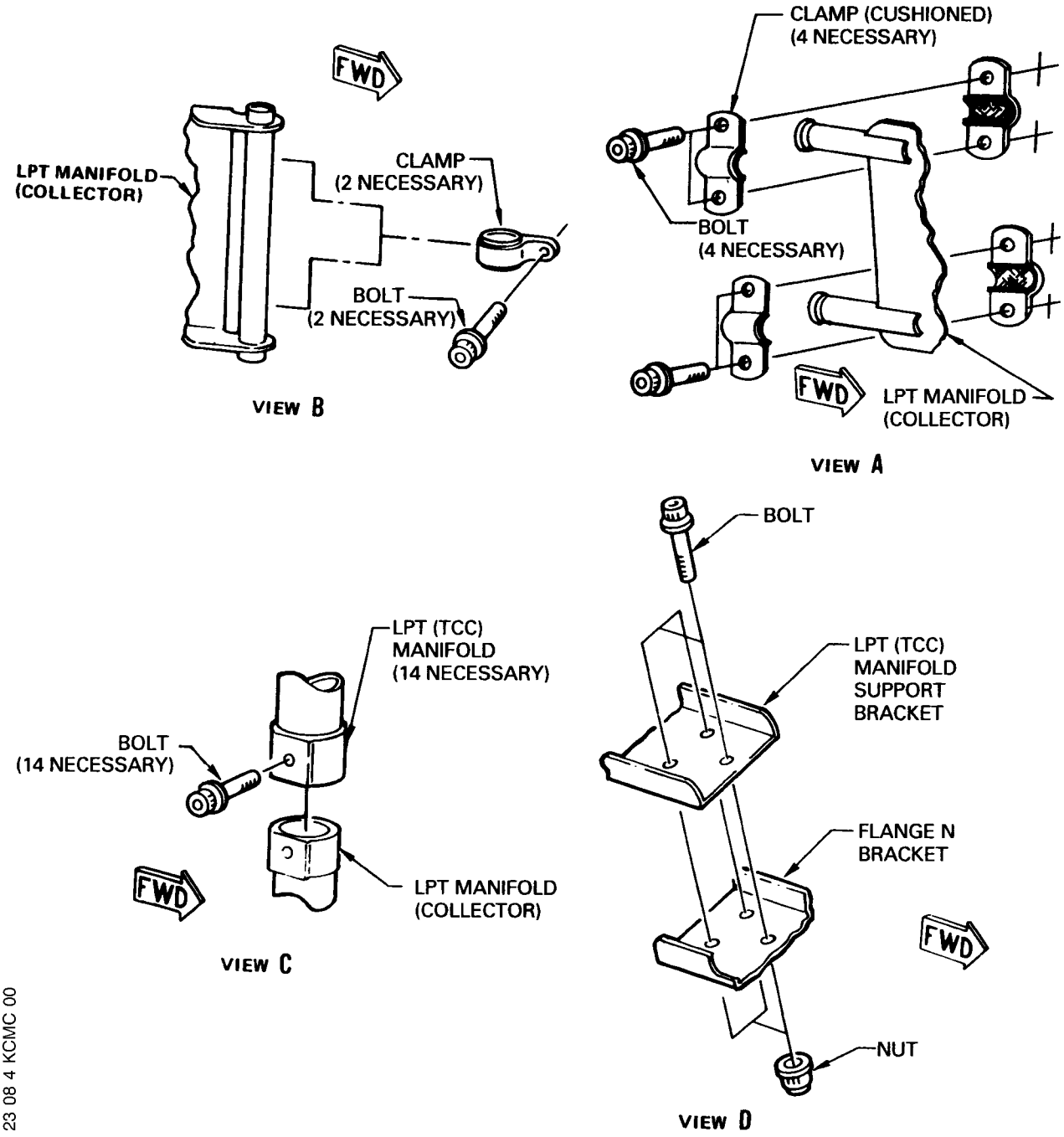
BM5 75 23 08 4 KAME 00

Turbine Case Cooling (TCC)
LPT Collector for PHASE I Engine Configuration (Sheet 7/7)
Figure 401



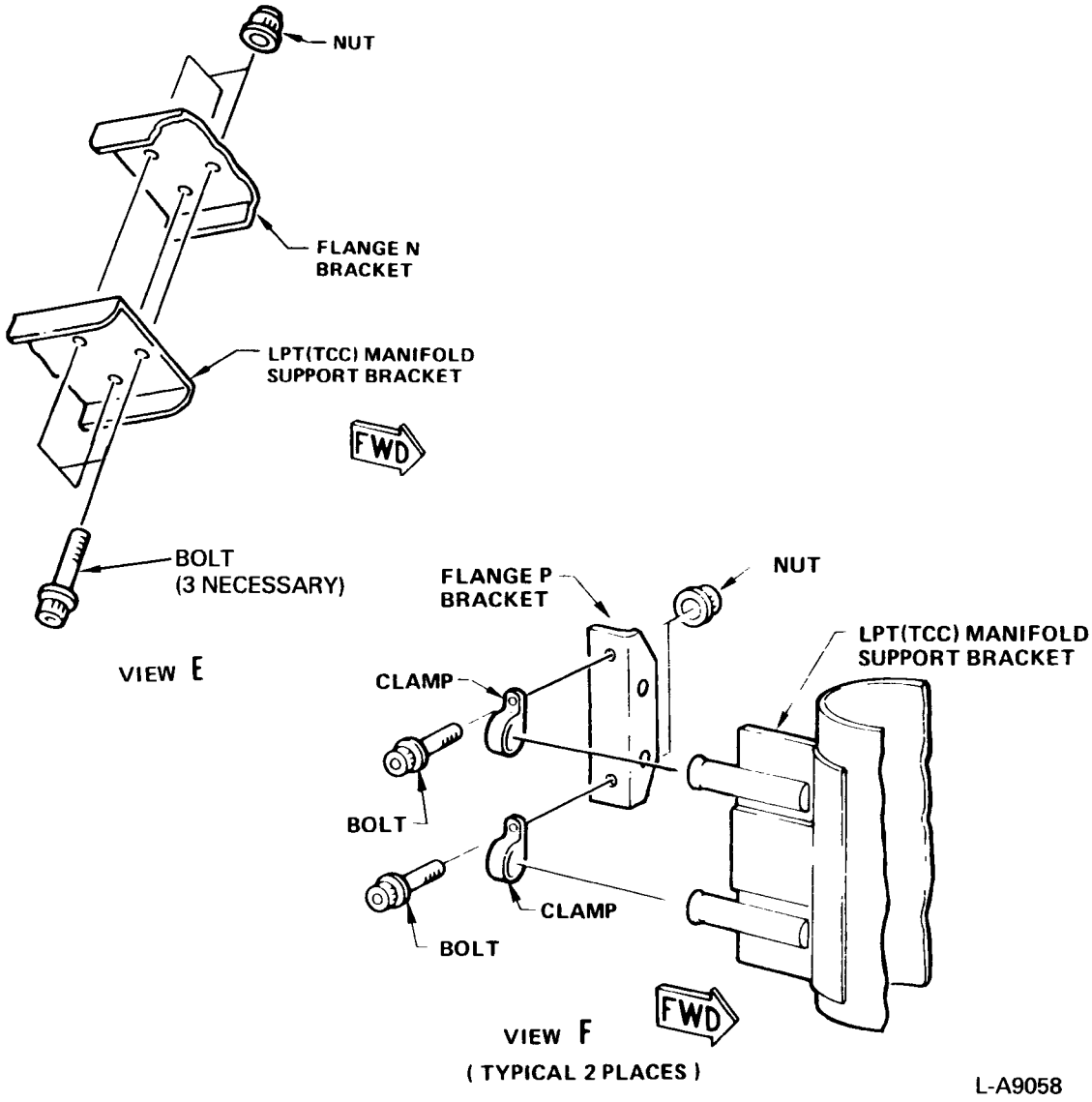
BM5 75 23 08 4 KCMA 00

Turbine Case Cooling (TCC) LPT Collector
for PHASE III Engine Configuration (Sheet 1/5)
Figure 402



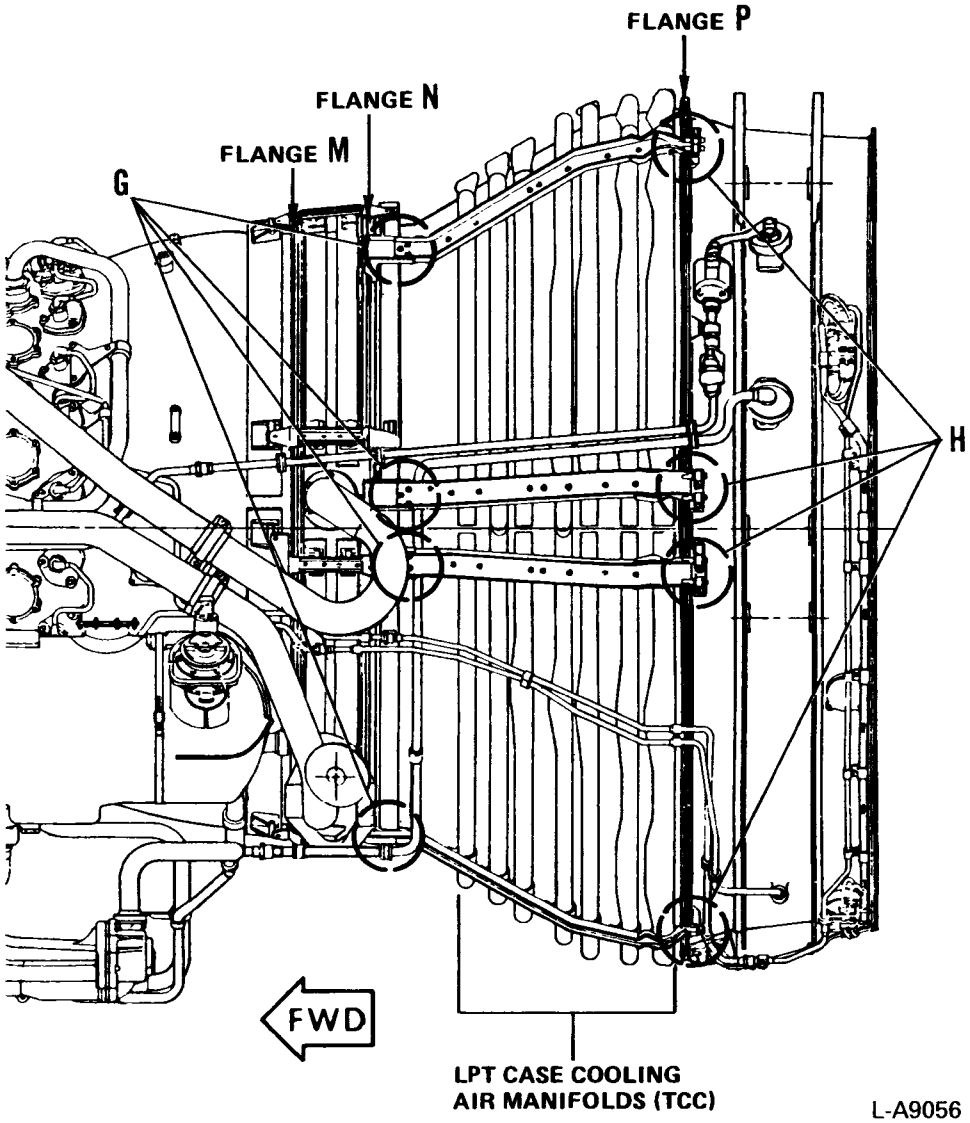
BM5 75 23 08 4 KCMC 00

Turbine Case Cooling (TCC) LPT Collector
for PHASE III Engine Configuration (Sheet 2/5)
Figure 402



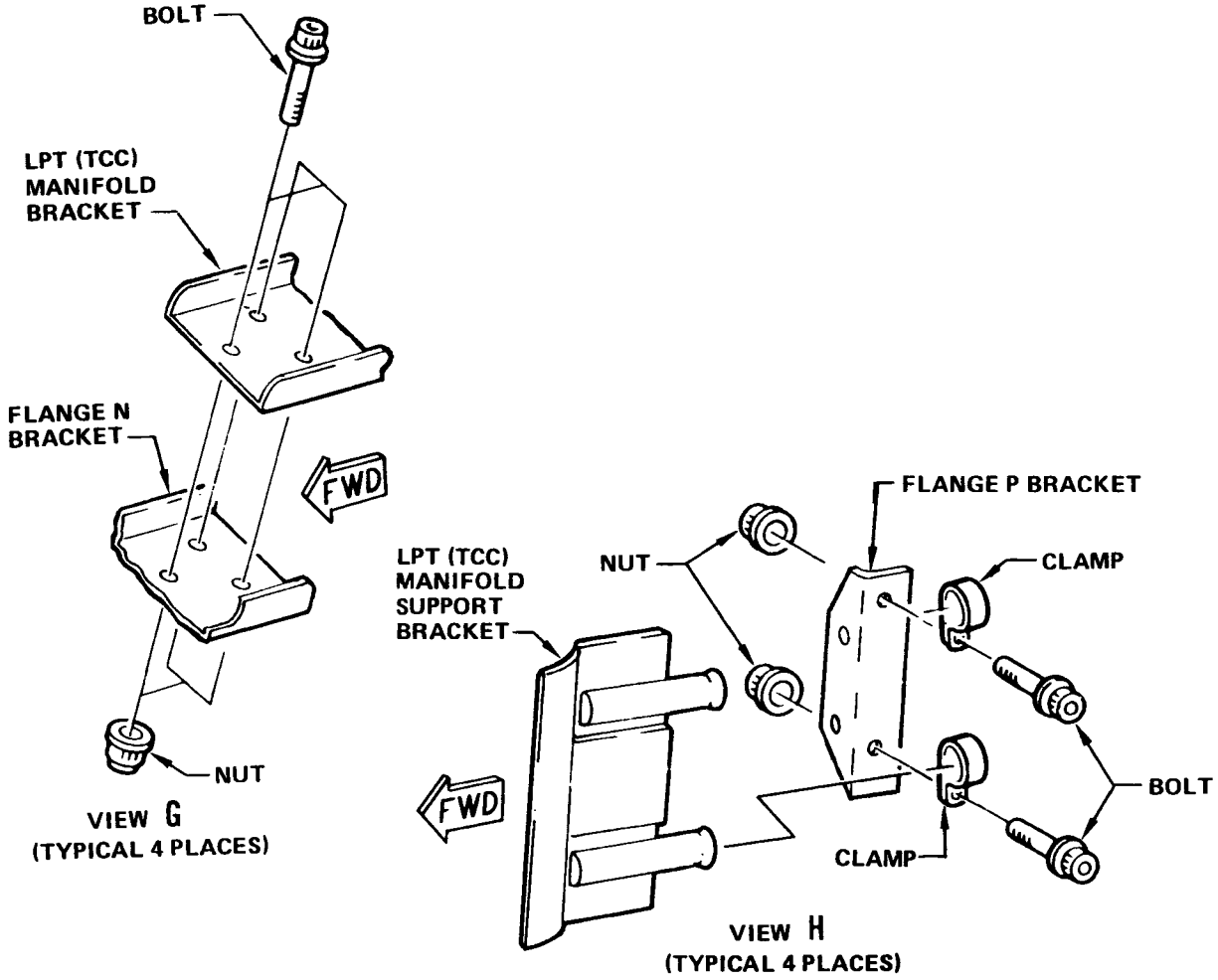
BM5 75 23 08 4 KCME 00

Turbine Case Cooling (TCC) LPT Collector
for PHASE III Engine Configuration (Sheet 3/5)
Figure 402



BM5 75 23 08 4 KCMG 00

Turbine Case Cooling (TCC) LPT Collector
for PHASE III Engine Configuration (Sheet 4/5)
Figure 402



BM5 75 23 08 4 KCMJ 00

Turbine Case Cooling (TCC) LPT Collector
for PHASE III Engine Configuration (Sheet 5/5)
Figure 402

TURBINE CASE COOLING (TCC) LPT MANIFOLDS - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Covers
C.	Protective Closures
D.	Torque Wrench
E.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
F.	Packing
G.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
H. Material No.P03-001	Oils (Ref. 70-00-00)
I. Material No.P05-289	Special Materials (Ref. 70-00-00)
J. Material No.P05-291	Special Materials (Ref. 70-00-00)
K. Material No.P05-292	Special Materials (Ref. 70-00-00)
R L. Material No.P06-021	Lubricants (Ref. 70-00-00)
R M. Material No.P06-054	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant-General
- 71-13-00, P. Block 301	Cowl Doors
- 73-24-08, P. Block 401	FADEC Electrical Harness

2. Procedure for PHASE I Configured Engines

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove FADEC thermocouple and airframe cable (W6) (Ref. 73-24-08, P. Block 401).

B. Removal (Ref. Fig. 401, 402, 403)
(Ref. Fig. 404, 405, 406)
(1)Remove pylon drain bracket tube assembly as follows :
(a)Remove clamp securing tube to support bracket.
(b)Remove tube coupling nut from drain mast union.
(c)Disconnect pylon drain tube from union on pylon drain bracket tube assembly. Remove tube.

Pre SB PW4ENG 79-76

(2)Remove No. 4 bearing oil pressure tube assembly (rear) (LP16) as follows : (Ref. Fig. 401, 402, 403).
(a)Remove hose clamps securing spray shield to front tube connection forward of Flange M at approximately 10 o'clock position. Remove shield from engine. Remove lockwire or safety cable and disconnect tube nut from coupling.
(b)Remove hose clamp securing spray shield to rear tube connection on exhaust case at approximately 10:30 o'clock position. Remove spray shield. Remove lockwire or safety cable and disconnect tube nut from

strainer housing.
(c)Remove bolt, spacer, nut and clamps securing tube to No.4 bearing oil scavenge tube rearward of flange N.
(d)Remove bolts, nuts, and clamps securing pressure tube to Flange M, N and P brackets. Remove tube from engine and install protective closures.

END of Pre SB PW4ENG 79-76
POST SB PW4ENG 79-76

(3)Remove No. 4 bearing oil pressure tube assemblies (LP47) and (LP48) which replace (LP16) as follows (Ref. Fig. 404, 405).
(a)Remove clamps and the tube spray shields at the (LP48) tube to the strainer housing connection, at the (LP47) tube to the (LP48) tube connection and at the (LP47) tube to the (LP15) tube connection. See views G, CA and LA.
(b)Remove clamps, bolts and nuts as shown in views M, N, B1, P, R and F.
(c)Remove the (LP48) tube from the strainer housing and the (LP47) tube. See views G and CA.
(d)Remove the element housing from the tube nut at approximately the 7 o'clock position. See view G.
(e)Remove the No. 4 bearing strainer element from the element housing. See view G.
(f)Remove and discard packing from the groove in the strainer element. See view G.
(g)Remove bolts and clamps. See views U, T, and S.
(h)Remove the coupling nut that attaches (LP15) tube to the (LP47) tube. See view LA.

END of SB PW4ENG 79-76
Pre SB PW4ENG 79-75

(4)Remove the No. 4 bearing scavenge tube assembly (rear) (LR06) as follows : (Ref. Fig. 401, 402, 403)
(a)Remove hose clamps securing spray shield to front tube connection forward of flange M at approximately 10 o'clock position. Remove shield from engine. Remove lockwire or safety cable and disconnect tube nut from coupling.
(b)Remove hose clamp securing spray shield to rear tube connection on exhaust case at approximately 10:30 o'clock position. Remove shield from engine. Remove lockwire or safety cable and disconnect tube nut from strainer housing.
(c)Remove bolt, spacer, nut, and clamps securing tube to No. 4 bearing oil scavenge tube rearward of flange N. Remove bolts, nuts, and clamps securing pressure tube to flange M, N, and P brackets. Remove tube from engine and install protective closures.

END of Pre SB PW4ENG 79-75
POST SB PW4ENG 79-75

(5)Remove (rear) No. 4 bearing scavenge tube assembly (LR06) as follows. (Ref. Fig. 401, 402, 403)
(a)Remove hose clamp securing the tube shield to the bracket inboard side of flange M at approximately 7 o'clock position. Remove the lockwire or safety cable and disconnect the (LR05) hose and tube assembly nut from the (LR06) tube coupling.
(b)Remove lockwire or safety cable and disconnect tube elbow from exhaust

case internal tube nut at approximately 10 o'clock position.
(c)Remove bolts, nuts and clamps securing tube to flange N and P brackets. Remove tube from engine and install protective closures.
(d)Remove bolts, nuts and clamp bracket attached to flange M and N brackets at approximately 7 o'clock position.

END of SB PW4ENG 79-75
Pre SB PW4ENG 79-76

(6)Remove (rear) No. 4 bearing scavenge tube assembly (LR06) as follows. (Ref. Fig. 401, 402, 403)
(a)Remove hose clamp securing the tube shield to the bracket inboard side of flange M at approximately 7 o'clock position. Remove the lockwire or safety cable and disconnect the (LR05) hose and tube assembly nut from the (LR06) tube coupling.
(b)Remove lockwire or safety cable and disconnnect tube elbow from exhaust case internal tube nut at approximately 10 o'clock position.
(c)Remove bolts, nuts and clamps securing tube to flange N and P brackets. Remove tube from engine and install protective closures.
(d)Remove bolts, nuts and clamp bracket attached to flange M and N brackets at approximately 7 o'clock position.

END of Pre SB PW4ENG 79-76
POST SB PW4ENG 79-76

(7)Remove (rear) No. 4 bearing scavenge tube assemblies (LR21) and (LR22) which replace (LR06) as follows : (Ref. Fig. 404, 405)
(a)Remove clamps and the tube spray shields at the (LR21) tube to (LR22) tube connection and at the (LR05) tube to the (LR21) tube connection. See views E and DE.
(b)Remove clamps on the (LR22). See views A, B, C and D.
(c)Remove the (LR22) tube from the (LR21) tube and the port for the internal tube on the turbine exhaust case. See views E and AP.
(d)Remove clamps, nuts and bolts that secure (LR21) tube. See views F, O, Q and R.
(e)Remove the (LR21) tube from the (LR05) tube. See view DE.

END SB PW4ENG 79-76
Pre SB PW4ENG 79-76

(8)Remove No. 3 bearing oil vent tube assembly (rear) (LD02) as follows : (Ref. Fig. 401, 402, 403)
(a)Remove lockwire or safety cable and disconnect oil vent tube from adapter on turbine exhaust case at approximately 7 o'clock position.
(b)Remove lockwire and disconnect tube nut at tube connection just rearward of Flange M.
(c)Remove bolts, nuts, and clamps securing tube to Flange P brackets and Flange N brackets.
(d)Remove the bolt, nut, and clamp at approximately the 7:30 o'clock position on the exhaust case that secures the tube to the adjacent PT4.95 tube assembly (POST SB PW4 ENG 72-134).
(e)Remove bolt, nut, and clamp securing tube to adjacent tube between Flange N and Flange P.
Remove tube from engine and install protective closures.

(9)Remove the (rear) FADEC PT4.95 pressure tube assembly (AS02) as follows : (Ref. Fig. 401, 402, 403)

(a)Remove lockwire or safety cable from tube nut and disconnect from tee (water drain) at 6 o'clock position on PT4.95 manifold, rearward of Flange P.
(PRE SB PW4 ENG 72-134).
(b)Remove the lockwire or safety cable and disconnect the tube nut from the tube coupling at the rear of Flange P and approximately the 7 o'clock position (POST SB PW4 ENG 72-134).
(c)Remove the bolt, nut, and clamp that secures the tube to the Flange P bracket at approximately the 7 o'clock position (PRE SB PW4 ENG 72-134).
(d)Remove lockwire or safety cable from tube connection rearward of Flange N at approximately the 8 o'clock position and disconnect tube nut from tube adapter.
(e)Remove the tube from the engine and install protection covers.

END Pre SB PW4ENG 79-76

POST SB PW4ENG 79-76

(10)Remove the (rear) No. 3 bearing oil vent tube assembly (LD02) and the (rear) FADEC PT4.95 pressure tube assembly (AS02) as follows : (Ref. Fig. 404, 405)
(a)Remove clamps, nut and bolts from the (AS27) tube, the (LD02) tube, the (AS02) tube and the (LP48) tube. See views H, I, J, K and L.
(b)Remove the bolt that attaches the (AS02) tube to the bracket. See view G.
(c)Remove the (AS02) tube from the (AS03) and (AS27) tubes.
(d)Remove the (LD02) tube from the (LD01) tube and to the turbine exhaust case.

END of SB PW4ENG 79-76

(11)Remove all bolts securing manifolds (upper and lower) to LPT cooling air collector (Ref. Fig. 406).
(12)Remove bolts and nuts securing cooling air manifold brackets to bracket on Flange N.
NOTE : Bolt and nut at approximately 8 o'clock position holds clamp supporting HPT tube.
(13)Remove bolts, nuts, spacers, and clamps that attach the rear mounts of cooling manifolds to brackets on Flange P (PRE SB PW4 ENG 75-50).
(14)Remove the bolts, nuts and clamps that attach the rear mounts of the cooling manifolds to brackets on flange P (POST SB PW4 ENG 75-50).
(15)Rotate lower half of LPT cooling air manifolds around LPT case to disengage manifolds from collector and remove lower cooling manifolds from engine.
(16)Rotate upper half of LPT cooling air manifolds around LPT case to disengage manifolds from collector. Remove upper cooling manifolds from engine.
(17)Remove the upper and lower cover assemblies from the rear (No. 7) of the manifold (collector) (POST SB PW4 ENG 75-53).
(18)Install protective covers.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

2. Procedure for PHASE III Configured Engine

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the left and right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove FADEC thermocouple and airframe cable (W6) (Ref. 73-24-08, P. Block 401).

B. Removal (Ref. Fig. 407, 408, 409)
(Ref. Fig. 410, 411)

Pre SB PW4ENG 79-76

(1)Remove No. 4 bearing oil pressure tube assembly rear (LP16) as follows (Ref. Fig. 407, 408).
(a)Remove the clamps that attach the spray shield to the front tube connection forward of flange M at approximately the 10 o'clock position. Remove the shield from the engine. Remove the lockwire or safety cable and disconnect the tube nut from the coupling.
(b)Remove the hose clamps that attach the spray shield to the rear tube connection rearward of flange P at approximately the 10:30 o'clock position. Remove the shield from the engine. Remove the lockwire or safety cable and disconnect the tube nut from coupling.
(c)Remove the bolts, nuts, spacer, and clamps that attach the pressure tube. Remove the tube from engine and install protective closures.

END Pre SB PW4ENG 79-76

POST SB PW4ENG 79-76

(2)Remove No. 4 bearing oil pressure tube assemblies (LP47) and (LP48) which replace (LP16) as follows (Ref. Fig. 409, 410).
(a)Remove clamps and the tube spray shields at the (LP48) tube to the strainer housing connection, at the (LP47) tube to the (LP48) tube connection and at the (LP47) tube to the (LP15) tube connection. See views G, CA and LA.
(b)Remove clamps, bolts and nuts as shown in views M, N, B1, P, R and F.
(c)Remove the (LP48) tube from the strainer housing and the (LP47) tube. See views G and CA.
(d)Remove the element housing from the tube nut at approximately the 7 o'clock position. See view G.
(e)Remove the No. 4 bearing strainer element from the element housing. See view G.
(f)Remove and discard packing from the groove in the strainer element. See view G.
(g)Remove bolts and clamps. See views U, T, and S.
(h)Remove the coupling nut that attaches (LP15) tube to the (LP47) tube. See view LA.

END of SB PW4ENG 79-76

Pre SB PW4ENG 79-75

(3)Remove the No. 4 bearing scavenge tube assembly (rear) (LR06) as follows (Ref. Fig. 407, 408).
(a)Remove the lockwire or safety cable and disconnect the rear scavenge tube elbow from the exhaust case internal tube at approximately the 10 o'clock position.

(b)Remove the bolt, nut, and clamp that attach the spray shield to the bracket on flange M. Remove the clamp that holds the forward end of the spray shield to the tube and remove the spray shield.
(c)Remove the lockwire and disconnect the tube nut at flange M from the tube adapter.
(d)Remove the bolts, nuts, and clamps that attach the tube. Remove the rear scavenge tube from the engine and install protective closures.

END of Pre SB PW4ENG 79-75
POST SB PW4ENG 79-75

(4)Remove (rear) No. 4 bearing scavenge tube assembly (LR06) as follows (Ref. Fig. 407, 408).
(a)Remove hose clamp securing the tube shield to the bracket inboard side of flange M at approximately 7 o'clock position. Remove the lockwire and or safety cable disconnect the (LR05) hose and tube assembly nut from the (LR06) tube coupling.
(b)Remove lockwire or safety cable and disconnect tube elbow from exhaust case internal tube nut at approximately 10 o'clock position.
(c)Remove bolts, nuts and clamps securing tube to flange N and P brackets. Remove tube from engine and install protective closures.
(d)Remove bolts, nuts and clamp bracket attached to flange M and N brackets at approximately 7 o'clock position.

END of SB PW4ENG 79-75
Pre SB PW4ENG 79-76

(5)Remove (rear) No. 4 bearing scavenge tube assembly (LR06) as follows (Ref. Fig. 407, 408).
(a)Remove hose clamp securing the tube shield to the bracket inboard side of flange M at approximately 7 o'clock position. Remove the lockwire or safety cable and disconnect the (LR05) hose and tube assembly nut from the (LR06) tube coupling.
(b)Remove lockwire or safety cable and disconnnect tube elbow from exhaust case internal tube nut at approximately 10 o'clock position.
(c)Remove bolts, nuts and clamps securing tube to flange N and P brackets. Remove tube from engine and install protective closures.
(d)Remove bolts, nuts and clamp bracket attached to flange M and N brackets at approximately 7 o'clock position.

END of Pre SB PW4ENG 79-76
POST SB PW4ENG 79-76

(6)Remove (rear) No. 4 bearing scavenge tube assemblies (LR21) and (LR22) which replace (LR06) as follows : (Ref. Fig. 409, 410)
(a)Remove clamps and the tube spray shields at the (LR21) tube to (LR22) tube connection and at the (LR05) tube to the (LR21) tube connection. See views E and DE.
(b)Remove clamps on the (LR22). See views A, B, C and D.
(c)Remove the (LR22) tube from the (LR21) tube and the port for the internal tube on the turbine exhaust case. See views E and AP.
(d)Remove clamps, nuts and bolts that secure (LR21) tube. See views F, O, Q and R.
(e)Remove the (LR21) tube from the (LR05) tube. See view DE.

END of SB PW4ENG 79-76
Pre SB PW4ENG 79-76

(7)Remove No. 3 bearing oil vent tube assembly (rear) (LD02) as follows (Ref. Fig. 407, 408)
(a)Remove the lockwire or safety cable and disconnect the oil vent tube assembly from the adapter on the turbine exhaust case at approximately the 7 o'clock position.
(b)Remove the lockwire or safety cable and disconnect the tube nut at the tube connection just rearward of flange M.
(c)Remove the bolts, nuts, and clamps that attach the tube. Remove the tube from the engine and install protective closures.
(8)Remove the (rear) EEC PT4.95 pressure tube assembly (AS02) as follows (Ref. Fig. 407, 408).
(a)Remove the lockwire or safety cable and disconnect the tube nut from the tube coupling at the rear of flange P at approximately the 7 o'clock position.
(b)Remove the lockwire or safety cable from the tube connection rearward of flange N at approximately the 8 o'clock position and disconnect tube nut from tube adapter.
(c)Remove the tube from the engine and install protection covers.

END of Pre SB PW4ENG 79-76

POST SB PW4ENG 79-76

(9)Remove the (rear) No. 3 bearing oil vent tube assembly (LD02) and the (rear) EEC PT4.95 pressure tube assembly (AS02) as follows (Ref. Fig. 409, 410)
(a)Remove clamps, nut and bolts from the (AS27) tube, the (LD02) tube, the (AS02) tube and the (LP48) tube. See views H, I, J, K and L.
(b)Remove the bolt that attaches the (AS02) tube to the bracket. See view G.
(c)Remove the (AS02) tube from the (AS03) and (AS27) tubes.
(d)Remove the (LD02) tube from the (LD01) tube and to the turbine exhaust case.

END of SB PW4ENG 79-76

(10)Remove all the bolts that attach the manifolds (upper and lower) to the LPT cooling air collector (Ref. Fig. 411).
(11)Remove the bolts and nuts that attach the cooling air manifold brackets to the brackets on flange N.
NOTE : The bolt and nut at approximately the 8 o'clock position holds the clamp that supports the HPT tube.
(12)Remove the bolts, nuts and clamps that attach the rear mounts of the cooling manifolds to brackets on flange P.
(13)Rotate the lower half of the LPT cooling air manifolds around the LPT case to disengage the manifolds from the collector and remove the lower cooling manifolds from the engine.
(14)Rotate the upper half of the LPT cooling air manifolds around the LPT case to disengage the manifolds from the collector. Remove the upper cooling manifolds from the engine.
(15)Install protective covers.

**ON A/C 101-200,

C. Installation (Ref. Fig. 401, 402, 403)
(Ref. Fig. 404, 405, 406)

(1)Remove protective closures.

(2)Position upper half of LPT cooling air manifolds to LPT case and rotate around case engaging manifold ends with detail tubes of collector. (Ref. Fig. 406)

(3)Install bolts, threads lubricated with Material No.P03-001, to manifold ends to secure upper cooling manifolds to collector handtight only.

(4)Position lower half of LPT cooling air manifolds to LPT case and rotate around case engaging manifold ends with detail tubes of collector.

(5)Install bolts, threads lubricated with Material No.P03-001, to manifold ends to secure lower cooling manifolds to collector handtight only.

(6)Install cover assemblies on the upper and lower rear tubes (No. 7) of the manifold (collector). Attach the covers to the tubes with bolts, threads lubricated with Material No.P03-001 and tighten by hand (POST SB PW4ENG 75-53 and Pre SB PW4ENG 79-76 only).

(7)Install clamps to the rear mounts of the top half and lower half of the cooling air manifolds. Attach the manifolds to flange P brackets with bolts, threads lubricated with Material No.P03-001, spacers and nuts tightened by hand (PRE SB PW4 ENG 75-50).

(8)Install clamps to the rear mounts of the top half and lower half of the cooling air manifolds. Attach the manifolds to flange P brackets with bolts, threads lubricated with Material No.P03-001, and nuts tightened by hand (POST SB PW4 ENG 75-50).

(9)Install bolts, threads lubricated with Material No.P03-001, and nuts to secure forward end of cooling air manifold brackets to brackets on flange N handtight only.

NOTE : When installing bolt and nut at approximately 8 o'clock position, secure HPT tube clamp with bolt and nut.

(10)TORQUE bolts securing cooling air manifolds as follows :

(a)TORQUE bolts securing rear mount clamps to Flange P brackets to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN).

(b)TORQUE all bolts securing forward mount brackets to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(c)TORQUE all upper and lower cooling air manifolds to collector retaining bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(d)TORQUE upper and lower bolts that attach the cover assemblies to to rear of collector to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN) (POST SB PW4 ENG 75-53).

CAUTION : USE OF LUBRICANTS ON FADEC SENSING TUBES, ADAPTERS OR PACKINGS COULD RESULT IN CONTAMINATION OF FADEC.

Pre SB PW4ENG 79-76

(11)Install (rear) FADEC PT4.95 tube assembly (AS02) as follows : (Ref. Fig. 401, 402, 403).

(a)Remove protective closures from the tube fittings.

(b)Secure the tube nut to a tee at approximately the 6 o'clock position and rearward of Flange P (PRE SB PW4 ENG 72-134).

(c)Secure the tube nut to the tube coupling at approximately the 7 o'clock position and rearward of Flange P (POST SB PW4 ENG 72-134).

(d)Secure the tube nut to the tube coupling at approximately the 8 o'clock position and rearward of Flange N.

(e)Lubricate the threads of a bolt with Material No.P03-001. Secure the tube with a clamp, bolt, and nut to the bracket on Flange P at approximately the 6:30 o'clock position. TORQUE bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN) (PRE SB PW4 ENG 72-134).

(f)TORQUE tube nuts (both ends) to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(12)Install (rear) No. 3 bearing oil vent tube assembly (LD02) as follows : (Ref. Fig. 401, 402, 403)

(a)Remove protection covers and install oil vent tube to adapters,
R threads lubricated with Material No.P06-054, on exhaust case at approwimately 7 o'clock position and on forward end of tube to front oil vent tube just rearward of Flange M and rearward of oil tank, handtight only.

(b)Install clamp to tube and secure to bracket on Flange N with bolt, threads lubricated with Material No.P03-001, and nut handtight only.

(c)Install clamps to tube and secure to brackets on Flange P with bolts, threads lubricated with Material No.P03-001, and nuts handtight only.

(d)Install clamp to tube and secure to adjacent tube between Flange N and Flange P with bolt, threads lubricated with Material No.P03-001, and nut handtight only.

(e)Lubricate the threads of the bolt with Material No.P03-001. Secure the tube to the adjacent PT4.95 tube assembly with clamps, bolt, and nut at approximately the 7:30 o'clock position and rearward of Flange P (POST SB PW4 ENG 72-134).

(f)TORQUE all clamp bolts to between 36 and 40 lbf.in. (0.41 and 045 m.daN).

(g)TORQUE tube nuts (both ends) to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

END of Pre SB PW4ENG 79-76

POST SB PW4ENG 79-76

(13)Install brackets on the turbine case cooling brackets. TORQUE the bolts to between 24 and 32 lbf.in. (0.27 and 0.36 m.daN) (Ref. Fig. 404, 405).

(14)Install the (rear) FADEC PT4.95 tube assembly (LD02) as follows : (Ref. Fig. 404, 405).

(a)Attach the (LD02) tube to the (LD01) and the turbine exhaust case, handtight only.

(b)Attach the (AS02) tube to the (AS03) and (AS27) tubes, handtight only.

(c)Install bolt to attach the (AS02) tube to the bracket handtight only. See view G.

(d)Install the clamp on the (LD02) tube and the clamp on the (LP48) tube and secure with nut and bolt, handtight only. See view L.

(e)Install the clamp on the (AS02) and (LD02) tubes and secure with a bolt, handtight only. See view H.

(f)Install clamp on the (AS02) and (LD02) tubes and secure with nut and bolt, handtight only. See View I.

(g)Install clamps on the (AS02) and (LD02) tubes and secure with nut and

bolt, handtight only. See View J.
(h)Install clamp on (AS27) and (LD02) tubes and secure with nut and bolt, handtight only. See view K.
(i)TORQUE the (AS02) tube to the (AS03) tube and the (AS27) tube to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).
(j)TORQUE the (LD02) tube to the internal tube and the (LD01) tube to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).
(k)TORQUE all clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

END of SB PW4ENG 79-76

Pre SB PW4ENG 79-75

(15)Install (rear) No. 4 bearing scavenge tube assembly (LR06) as follows : (Ref. Fig. 401, 402, 403).
(a)Install rear scavenge tube, elbow threads lubricated with Material
R No.P06-054 to tube nut on internal tube at approximately 10 o'clock position on exhaust case and to adapter, threads lubricated with
R Material No.P06-054, on front scavenge tube at Flange M at approximately 7 o'clock position handtight only.
(b)Install clamps to tube and secure to brackets on Flange P with bolts, threads lubricated with Material No.P03-001, and nuts, handtighten only.
(c)Install clamp to tube and secure to bracket on Flange N with bolt, threads lubricated with Material No.P03-001, and nut handtight only.
(d)Install clamp to tube and secure to bracket on Flange M with bolt, threads lubricated with Material No.P03-001, and nut handtight only.
(e)TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(f)TORQUE tube nut at exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(g)TORQUE tube nut at Flange N connection to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(h)Position spray shield to inboard side of Flange N connection and secure forward end with clamp. TORQUE clamp to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).
(i)Install clamp to rear end of spray shield over tube and secure to Flange N bracket with bolt, threads lubricated with Material No.P03-001, and nut. TORQUE bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

END of Pre SB PW4ENG 79-75

POST SB PW4ENG 79-75

(16)Install (rear) No. 4 bearing scavenge tube assembly (LR06) as follows (Ref. Fig. 401, 402, 403).
(a)Install rear scavenge tube, threads lubricated with Material
R No.P06-054, to exhaust case internal tube nut at approximately 10 o'clock position, and to the tube (LR05) coupling forward of flange M at approximately 7 o'clock position, handtight only.
(b)Install loop clamp bracket on flange M bracket at approximately 7 o'clock with bolts lubricated with Material No.P03-001, handtight

only. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(c)Secure tube to loop clamp bracket on flange M bracket with one clamp and bolt, lubricated with Material No.P03-001, handtight only. TORQUE clamp bolt to between 27 and 30 lbf.in. (0.31 and 0.34 m.daN).

(d)Install clamps, bolts, threads lubricated with Material No.P03-001, and nuts securing tube to Flange N and P brackets. TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(e)TORQUE tube nut at exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(f)TORQUE tube nut at flange N connection to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(g)Position tube shield to inboard side of flange M connection and secure forward end of shield with hose clamp. TORQUE hose clamp to between 15 and 18 lbf.in. (0.17 and 0.21 m.daN).

END of SB PW4ENG 79-75

Pre SB PW4ENG 79-76

(17)Install (rear) No. 4 bearing scavenge tube assembly (LR06) as follows (Ref. Fig. 401, 402, 403).

(a)Install rear scavenge tube, threads lubricated with Material
R No.P06-054, to exhaust case internal tube nut at approximately 10 o'clock position, and to the tube (LR05) coupling forward of flange M at approximately 7 o'clock position, handtight only.

(b)Install loop clamp bracket on flange M bracket at approximately 7 o'clock with bolts lubricated with Material No.P03-001, handtight only. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(c)Secure tube to loop clamp bracket on flange M bracket with one clamp and bolt, lubricated with Material No.P03-001, handtight only. TORQUE clamp bolt to between 27 and 30 lbf.in. (0.31 and 0.34 m.daN).

(d)Install clamps, bolts, threads lubricated with Material No.P03-001, and nuts securing tube to Flange N and P brackets. TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(e)TORQUE tube nut at exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(f)TORQUE tube nut at flange N connection to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(g)Position tube shield to inboard side of flange M connection and secure forward end of shield with hose clamp. TORQUE hose clamp to between 15 and 18 lbf.in. (0.17 and 0.21 m.daN).

END Pre SB PW4ENG 79-76

POST SB PW4ENG 79-76

(18)Install (rear) No. 4 bearing scavenge tube assemblies (LR21) and (LR22) which replace (LR06) as follows (Ref. Fig. 404, 405).

(a)Attach the (LR21) tube to the (LR05) tube handtight only. See view DE.

(b)Install clamps and secure with nuts and bolts, handtight only. See views F, O, R and Q.
(c)Attach the (LR22) tube to the (LR21) tube and the port for the internal tube on the turbine exhaust case, handtight only. Lubricate the threads that are on the internal tube with Material No.P03-001. See views E and AP.
(d)Install clamps on the (LR22) tube and secure with bolts, handtight only. See views A, B, C and D.
(e)TORQUE the (LR21) tube to the (LR05) tube to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(f)TORQUE the (LR21) tube to the (LR22) tube to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(g)TORQUE the internal tube nut to the (LR22) tube to between 270 and 300 lbf.in. (3.06 and 3.39 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(19)Install the shields for the No. 4 Bearing Oil Scavenge Lines as follows (Ref. Fig. 404, 405).
(a)Install shield at the (LR05) tube to the (LR21) tube connection. Secure shield with clamp or bolt as applicable. See view DE.
(b)Install shield at the (LR21) tube to the (LR22) tube connection. Secure shield with clamp or bolt as applicable. See view E.
(c)TORQUE the clamps to between 15 and 18 lbf.in. (0.17 and 0.21 m.daN).
(d)TORQUE the nut and bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

END of SB PW4ENG 79-76
Pre SB PW4ENG 79-76

(20)Install (rear) No. 4 bearing oil pressure tube assembly (LP16) as follows (Ref. Fig. 401, 402, 403).
(a)Install pressure tube, threads lubricated with Material No. P03-001, to No. 4 bearing strainer housing and tube coupling forward of flange M handtight only.
(b)Install clamps, bolts, threads lubricated with Material No. P03-001, and nuts securing tube to flange M, flange N, and Flange P brackets. TORQUE clamp bolts to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN).
Install clamps, bolt, threads lubricated with Material No.P03-001, spacer and nut securing tube to No.4 bearing oil scavenge tube rearward of Flange N. TORQUE bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
(c)TORQUE tube nuts (both end) to between 450 and 500 lbf. in. (5.08 and 5.65 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(d)Install spray shield to inboard side of pressure tube connection at 10:30 o'clock position at flange P. Secure with hose clamps and TORQUE to between 15 and 18 lbf. in. (0.17 and 0.20 m.daN).

(e)(Pre SB PW4 ENG 79-54) Install spray shield to inboard side of pressure tube front connection forward of Flange M. Secure with hose clamps and TORQUE to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN.).

(f)(Post SB PW4 ENG 79-54) Install the spray shield to the inboard side of the pressure tube connection forward of flange M. Secure the forward end of the shield to the bracket on the diffuser case with a clamp, bolt lubricated with Material No.P03-001.
TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN). Secure the rear of the shield with a hose clamp and TORQUE to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

END Pre SB PW4ENG 79-76

POST SB PW4ENG 79-76

(21)Install (rear) No. 4 bearing oil pressure tube assemblies (LP47) and (LP48) which replace (LP16) as follows. Also install the No. 4 bearing strainer element as follows (Ref. Fig. 404, 405).

(a)Attach the coupling nut on the (LP15) tube to the (LP47) tube, handtight only. See view LA.

(b)Install clamps and secure with bolts. See views U, T and S.

(c)Install packing, lubricated with Material No.P03-001 to the groove in the No. 4 bearing strainer element. See view G.

(d)Install the No. 4 bearing strainer element into the No. 4 bearing strainer element housing, handtight only. Lubricate threads with Material No.P03-001. See view G.

(e)Install the element housing, lubricated with Material No.P03-001, on to the tube nut at approximately the 7 o'clock position, handtight only.
See view G.

(f)Attach the (LP48) tube to the strainer housing and the (LP47) tube, handtight only. See views G and CA.

(g)Install clamps and secure with bolts and nuts as necessary. See views M, N, B1, P, R and F.

(h)TORQUE the strainer to the strainer housing to between 150 and 170 lbf.in. (1.7 and 1.92 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(i)TORQUE the internal tube nut to the strainer housing to between 270 and 300 lbf.in. (3.05 and 3.35 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(j)TORQUE the (LP48) tube to the strainer housing to between 340 and 375 lbf.in. (3.34 and 4.23 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(k)TORQUE the (LP48) tube to the (LP47) tube to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(l)TORQUE the (LP15) tube to the (LP47) tube to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(m)TORQUE all the installed clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(22)Install the shields for the No. 4 Bearing Oil Pressure Lines as follows. (Ref. Fig. 404, 405)

(a)Install shield at the (LP47) tube to the (LP15) tube connection. Secure shield with clamps. See view LA.

(b)Install shield at the (LP47) tube to the (LP48) tube connection. Secure shield with clamps. See view CA.

(c)Install shield at the (LP48) tube to the strainer housing connection. Secure shield with clamps. See view G.

(d)TORQUE all clamps to between 15 and 18 lbf.in (0.17 and 0.21 m.daN).

END of SB PW4ENG 79-76

(23)Install pylon drain bracket tube assembly.

(a)Position pylon drain bracket tube assembly to drain mast and pylon drain tube. Secure coupling nuts, fingertight.

(b)Position clamp on tube and secure to support bracket with bolt, washer, and nut. TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m. daN).

(c)TORQUE tube coupling nuts to between 450 and 500 lbf.in. (5.08 and 5.65 m.daN).

R **ON A/C 101-105,

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C. Installation (Ref. Fig. 407, 408, 409) (Ref. Fig. 410, 411).

(1)Remove protective closures.

(2)Install the upper half of the LPT cooling air manifolds to the LPT case and move them down to engage the manifold ends with the detail tubes of the collector (Ref. Fig. 411).

(3)Install bolts, threads lubricated with Material No.P03-001, to the manifold ends to attach the upper cooling manifolds to the collector handtight only.

(4)Install the lower half of the LPT cooling air manifolds to the LPT case and move them up to engage the manifold ends with the detail tubes of the collector.

(5)Install bolts, threads lubricated with Material No.P03-001, to the manifold ends to attach the lower cooling manifolds to the collector handtight only.

(6)Install clamps to the rear mounts of the top half and lower half of the cooling air manifolds. Attach the manifolds to the flange P brackets with bolts, threads lubricated with Material No.P03-001, and nuts tightened by hand.

(7)Install bolts, threads lubricated with Material No.P03-001, and nuts to attach the forward end of the cooling air manifold brackets to the brackets on flange N handtight only.

NOTE : Attach the HPT tube clamp, at approximately the 8 o'clock position, with a bolt and a nut.

(8)Torque the bolts that attach the cooling air manifolds as follows :
(a)TORQUE the bolts that attach the rear mount clamps to the flange P brackets to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(b)TORQUE all the bolts that attach the forward mount brackets to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(c)TORQUE all the upper and lower cooling air manifolds to collector retaining bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
CAUTION : USE OF LUBRICANTS ON THE EEC SENSING TUBES, ADAPTERS, OR PACKINGS COULD RESULT IN CONTAMINATION OF THE EEC.

Pre SB PW4ENG 79-76

(9)Install (rear) EEC PT4.95 tube assembly (AS02) as follows (Ref. Fig. 407, 408).
(a)Remove protection covers.
(b)Attach the tube nut to the tube coupling at approximately the 7 o'clock position and rearward of flange P.
(c)Attach the tube nut to the coupling at approximately the 8 o'clock position and rearward of flange N.
NOTE : Torque the tube when you install the No. 3 bearing oil vent tube (LD02).

(10)Install (rear) the No. 3 bearing oil vent tube assembly (LD02) as follows (Ref. Fig. 407, 411).
(a)Remove protection covers. Install the oil vent tube, threads lubricated
R with Material No.P06-054, on the exhaust case at approximately the 7 o'clock position and to the front oil vent tube just rearward of flange M and rearward of the oil tank handtight only.
(b)Install the clamp to the tube and attach it to the bracket on flange N with a bolt, threads lubricated with Material No.P03-001, and nut handtight only.
(c)Lubricate the threads of the bolts with Material No.P03-001, and install clamps to the tube and adjacent PT4.95 tube assembly (AS02). Attach the clamps on the tubes to brackets on flange P with the bolts and nuts, and tighten by hand.
(d)Lubricate the threads of the bolt with Material No.P03-001. Attach the tube to the adjacent PT4.95 tube assembly with clamps, bolt, and nut at approximately the 7:30 o'clock position and rearward of flange P.
(e)Install clamp to tube and attach to adjacent tube between flange N and flange P with bolt, threads lubricated with Material No.P03-001, and nut handtight only.
(f)TORQUE all clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(g)TORQUE the vent tube (LD02) tube nuts (both ends) to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(h)TORQUE the EEC PT4.95 pressure (AS02) tube nuts to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

END of Pre SB PW4ENG 79-76

POST SB PW4ENG 79-76

(11)Install brackets on the turbine case cooling brackets. TORQUE the bolts

to between 24 and 32 lbf.in (0.27 and 0.36 m) (Ref. Fig. 409, 410).

(12)Install the (rear) EEC PT4.95 tube assembly (AS02) and the (rear) No. 3 bearing oil vent tube assembly (LD02) as follows (Ref. Fig. 409, 410).

(a)Attach the (LD02) tube to the (LD01) and the turbine exhaust case, handtight only.

(b)Attach the (AS02) tube to the (AS03) and (AS27) tubes, handtight only.

(c)Install bolt to attach the (AS02) tube to the bracket handtight only. See view G.

(d)Install the clamp on the (LD02) tube and the clamp on the (LP48) tube and secure with nut and bolt, handtight only. See view L.

(e)Install the clamp on the (AS02) and (LD02) tubes and secure with a bolt, handtight only. See view H.

(f)Install clamp on the (AS02) and (LD02) tubes and secure with nut and bolt, handtight only. See View I.

(g)Install clamps on the (AS02) and (LD02) tubes and secure with nut and bolt, handtight only. See View J.

(h)Install clamp on (AS27) and (LD02) tubes and secure with nut and bolt, handtight only. See view K.

(i)TORQUE the (AS02) tube to the (AS03) tube and the (AS27) tube to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

(j)TORQUE the (LD02) tube to the internal tube and the (LD01) tube to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

(k)TORQUE all clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

END of SB PW4ENG 75-76

Pre SB PW4ENG 79-75

(13)Install (rear) No. 4 bearing scavenge tube assembly (LR06) as follows (Ref. Fig. 407, 408).

(a)Install the rear scavenge tube, threads lubricated with Material R No.P06-054, to the exhaust case internal tube at approximately the 10 o'clock position and to the front scavenge tube at approximately the 7 o'clock position, adjacent to flange M, handtight only.

(b)Install clamps to the tube and attach to the brackets on flange P with bolts, threads lubricated with Material No.P03-001, and nuts handtight only.

(c)Install a clamp to the tube and attach to the bracket on flange N with bolt, threads lubricated with Material No.P03-001, and nut handtight only.

(d)Install a clamp to the tube and attach to the bracket on flange M with bolt, threads lubricated with Material No.P03-001, and nut handtight only.

(e)TORQUE the clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(f)TORQUE the tube nut at the exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(g)TORQUE the tube nut at flange N connection to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(h)Install the spray shield to the inboard side of the flange N connection and attach the forward end with a hose clamp. TORQUE the hose clamp to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

(i)Install the clamp to the rear end of the spray shield over the tube and attach to the flange N bracket with a bolt, threads lubricated with Material No.P03-001, and a nut. TORQUE the bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

END of Pre SB PW4ENG 79-75

POST SB PW4ENG 79-75

(14)Install (rear) No. 4 bearing scavenge tube assembly (LR06) as follows (Ref. Fig. 407, 408).

(a)Install rear scavenge tube, threads lubricated with Material
R No.P06-054, to exhaust case internal tube nut at approximately 10 o'clock position, and to the tube (LR05) coupling forward of flange M at approximately 7 o'clock position, handtight only.

(b)Install loop clamp bracket on flange M bracket at approximately 7 o'clock with bolts lubricated with Material No.P03-001 handtight only. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(c)Secure tube to loop clamp bracket on flange M bracket with one clamp and bolt, lubricated with Material No.P03-001, handtight only. TORQUE clamp bolt between 27 and 30 lbf.in. (0.31 and 0.34 mdaN).

(d)Install clamps, bolts, threads lubricated with Material No.P03-001, and nuts securing tube to flange N and P brackets. TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(e)TORQUE tube nut at exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(f)TORQUE tube nut at flange N connection to between 475 and 525 lbf.in. (5.37 and 5.94 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(g)Position tube shield to inboard side of flange M connection and secure forward end of shield with hose clamp. TORQUE hose clamp to between 15 and 18 lbf.in (0.17 and 0.21 m.daN).

END of SB PW4ENG 79-75

Pre SB PW4ENG 79-76

(15)Install (rear) No. 4 bearing scavenge tube assembly (LR06) as follows (Ref. Fig. 407, 408).

(a)Install rear scavenge tube, threads lubricated with Material
R No.P06-054, to exhaust case internal tube nut at approximately 10 o'clock position, and to the tube (LR05) coupling forward of flange M at approximately 7 o'clock position, handtight only.

(b)Install loop clamp bracket on flange M bracket at approximately 7 o'clock with bolts lubricated with Material No.P03-001 handtight only. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(c)Secure tube to loop clamp bracket on flange M bracket with one clamp and bolt, lubricated with Material No.P03-001, handtight only. TORQUE clamp bolt between 27 and 30 lbf.in. (0.31 and 0.34 mdaN).

(d)Install clamps, bolts, threads lubricated with Material No.P03-001,

and nuts securing tube to flange N and P brackets. TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(e)TORQUE tube nut at exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(f)TORQUE tube nut at flange N connection to between 475 and 525 lbf.in. (5.37 and 5.94 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(g)Position tube shield to inboard side of flange M connection and secure forward end of shield with hose clamp. TORQUE hose clamp to between 15 and 18 lbf.in (0.17 and 0.21 m.daN).

END of Pre SB PW4ENG

POST SB PW4ENG 79-76

(16)Install (rear) No. 4 bearing scavenge tube assemblies (LR21) and (LR22) which replace (LR06) as follows (Ref. Fig. 409, 410).

(a)Attach the (LR21) tube to the (LR05) tube handtight only. See view DE.

(b)Install clamps and secure with nuts and bolts, handtight only. See views F, O, R and Q.

(c)Attach the (LR22) tube to the (LR21) tube and the port for the internal tube on the turbine exhaust case, handtight only. Lubricate the threads that are on the internal tube with Material No.P03-001. See views E and AP.

(d)Install clamps on the (LR22) tube and secure with bolts, handtight only. See views A, B, C and D.

(e)TORQUE the (LR21) tube to the (LR05) tube to between 475 and 525 lbf.in. (5.37 and 5.94 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(f)TORQUE the (LR21) tube to the (LR22) tube to between 475 and 525 lbf.in. (5.37 and 5.94 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(g)TORQUE the internal tube nut to the (LR22) tube to between 270 and 300 lbf.in. (3.1 and 3.4 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(17)Install the shields for the No. 4 Bearing Oil Scavenge Lines as follows (Ref. Fig. 409, 410).

(a)Install shield at the (LR05) tube to the (LR21) tube connection. Secure shield with clamp or bolt as applicable. See view DE.

(b)Install shield at the (LR21) tube to the (LR22) tube connection. Secure shield with clamp or bolt as applicable. See view E.

(c)TORQUE the clamps to between 15 and 18 lbf.in. (0.17 and 0.21 m.daN).

(d)TORQUE the nut and bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

END of SB PW4ENG 79-76

Pre SB PW4ENG 79-76

(18)Install (rear) No. 4 bearing oil pressure tube assembly (LP16) as follows (Ref. Fig. 407, 408).

(a)Remove protective closures. Install the tube, threads lubricated with Material No.P06-021, at flange P at the 10:30 o'clock position and forward of flange M at the 10 o'clock position handtight only.
(b)Install clamps and bolts, threads lubricated with Material No.P03-001, spacer and nut to attach the pressure tube.
(c)TORQUE the clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(d)TORQUE the tube nuts at each end of the pressure tube to between 450 and 500 lbf.in. (5.08 and 5.65 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(e)Install the spray shield to the inboard side of the pressure tube connection at the 10:30 o'clock position at flange P.
Attach with hose clamps and TORQUE to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).
(f)Install the spray shield to the inboard side of the pressure tube connection forward of flange M. Attach the forward end of the shield to the bracket on the diffuser case with a clamp and a bolt lubricated with Material No.P03-001. TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN). Attach the rear of the shield with a hose clamp and TORQUE to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

END of Pre SB PW4ENG 79-76
POST SB PW4ENG 79-76

(19)Install (rear) No. 4 bearing oil pressure tube assemblies (LP47) and (LP48) which replace (LP16) as follows. Also install the No. 4 bearing stainer element as follows (Ref. Fig. 409, 410).
(a)Attach the coupling nut on the (LP15) tube to the (LP47) tube, handtight only. See view LA.
(b)Install clamps and secure with bolts. See views U, T and S.
(c)Install packing, lubricated with Material No.P03-001 to the groove in the No. 4 bearing strainer element. See view G.
(d)Install the No. 4 bearing strainer element into the No. 4 bearing strainer element housing, handtight only. Lubricate threads with Material No.P03-001. See view G.
(e)Install the element housing, lubricated with Material No.P03-001, on to the tube nut at approximately the 7 o'clock position, handtight only.
See view G.
(f)Attach the (LP48) tube to the strainer housing and the (LP47) tube, handtight only. See views G and CA.
(g)Install clamps and secure with bolts and nuts as necessary. See views M, N, B1, P, R and F.
(h)TORQUE the strainer to the strainer housing to between 150 and 170 lbf.in. (1.7 and 1.92 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(i)TORQUE the internal tube nut to the strainer housing to between 270 and 300 lbf.in. (3.05 and 3.35 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.

(j)TORQUE the (LP48) tube to the strainer housing to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(k)TORQUE the (LP48) tube to the (LP47) tube to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(l)TORQUE the (LP15) tube to the (LP47) tube to 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Install the lockwire (Material No.P05-289) or the safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety the tube nuts.
(m)TORQUE all the installed clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(20)Install the shields for the No. 4 bearing oil pressure lines as follows. (Ref. Fig. 409, 410)
(a)Install shield at the (LP47) tube to the (LP15) tube connection. Secure shield with clamps. See view LA.
(b)Install shield at the (LP47) tube to the (LP48) tube connection. Secure shield with clamps. See view CA.
(c)Install shield at the (LP48) tube to the strainer housing connection. Secure shield with clamps. See view G.
(d)TORQUE all clamps to between 15 and 18 lbf.in (0.17 and 0.21 m.daN).

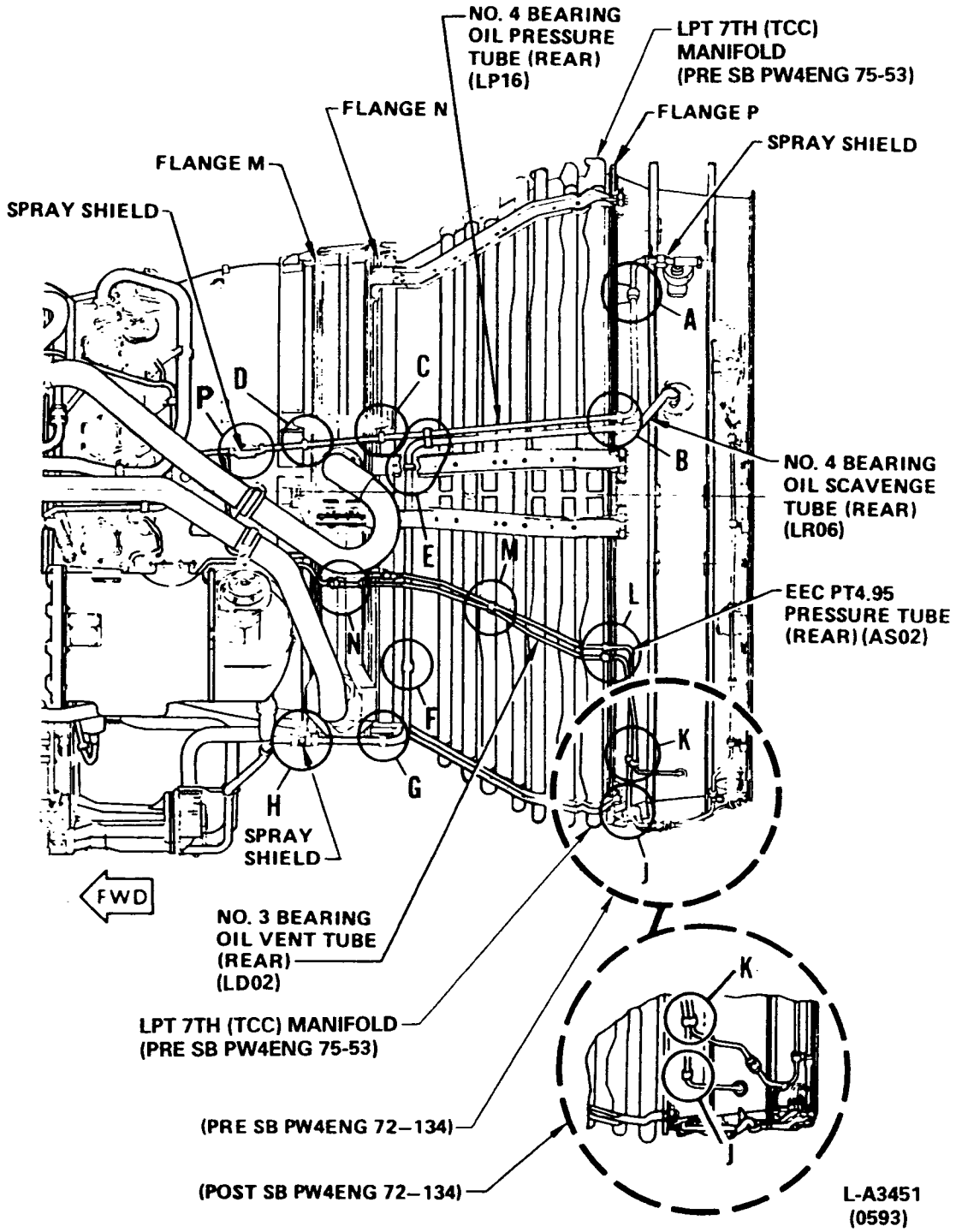
END of SB PW4ENG 79-76

**ON A/C 101-200,

(Post SB PW4ENG 79-75)

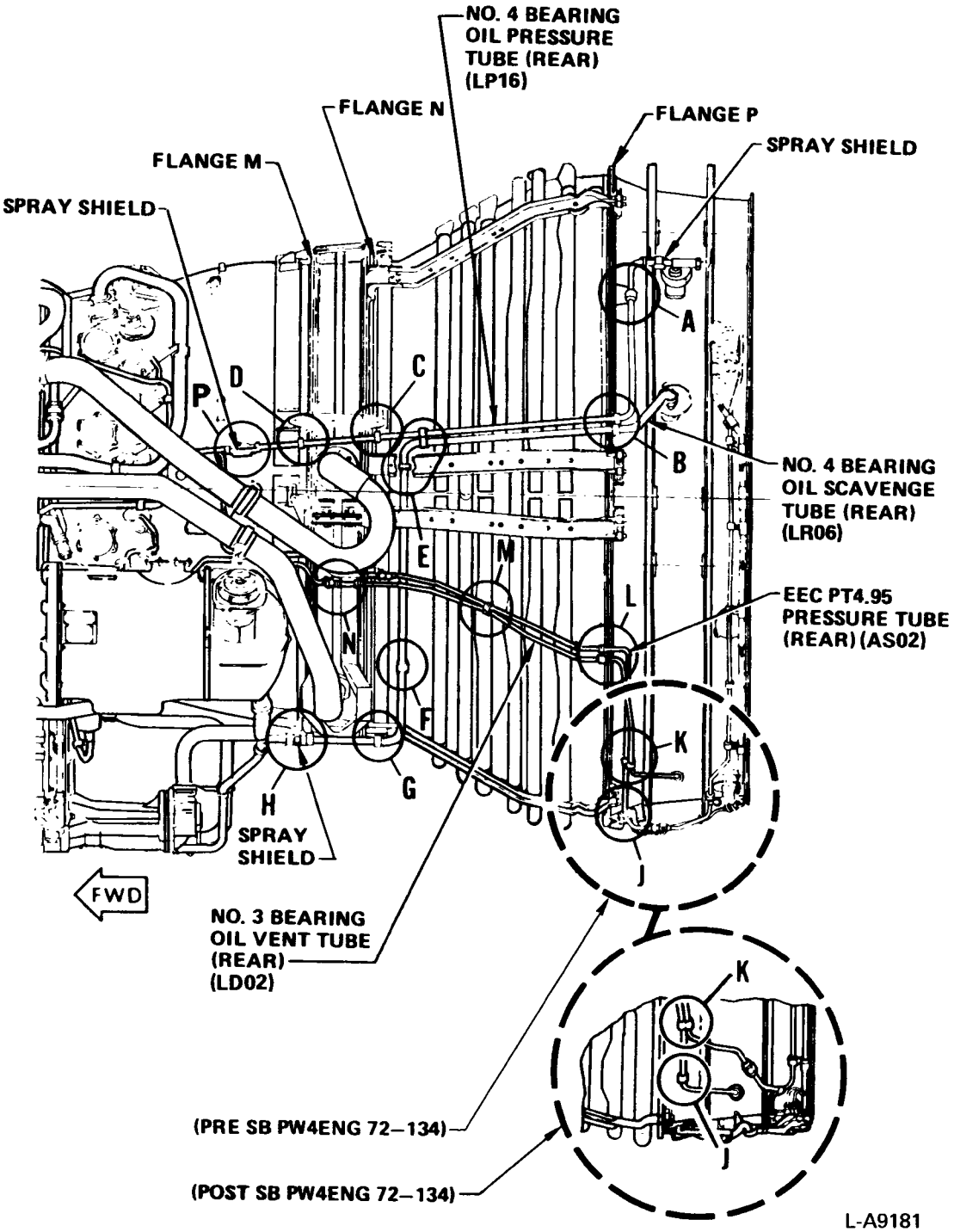
**ON A/C 101-200,

D. Close-Up and Test
(1)Install FADEC thermocouple and airframe cable (W6) (Ref. 73-24-08, P. Block 401).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close the left and right thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4)Test engine per test reference table (Ref. 71-00-00, P. Block 501).



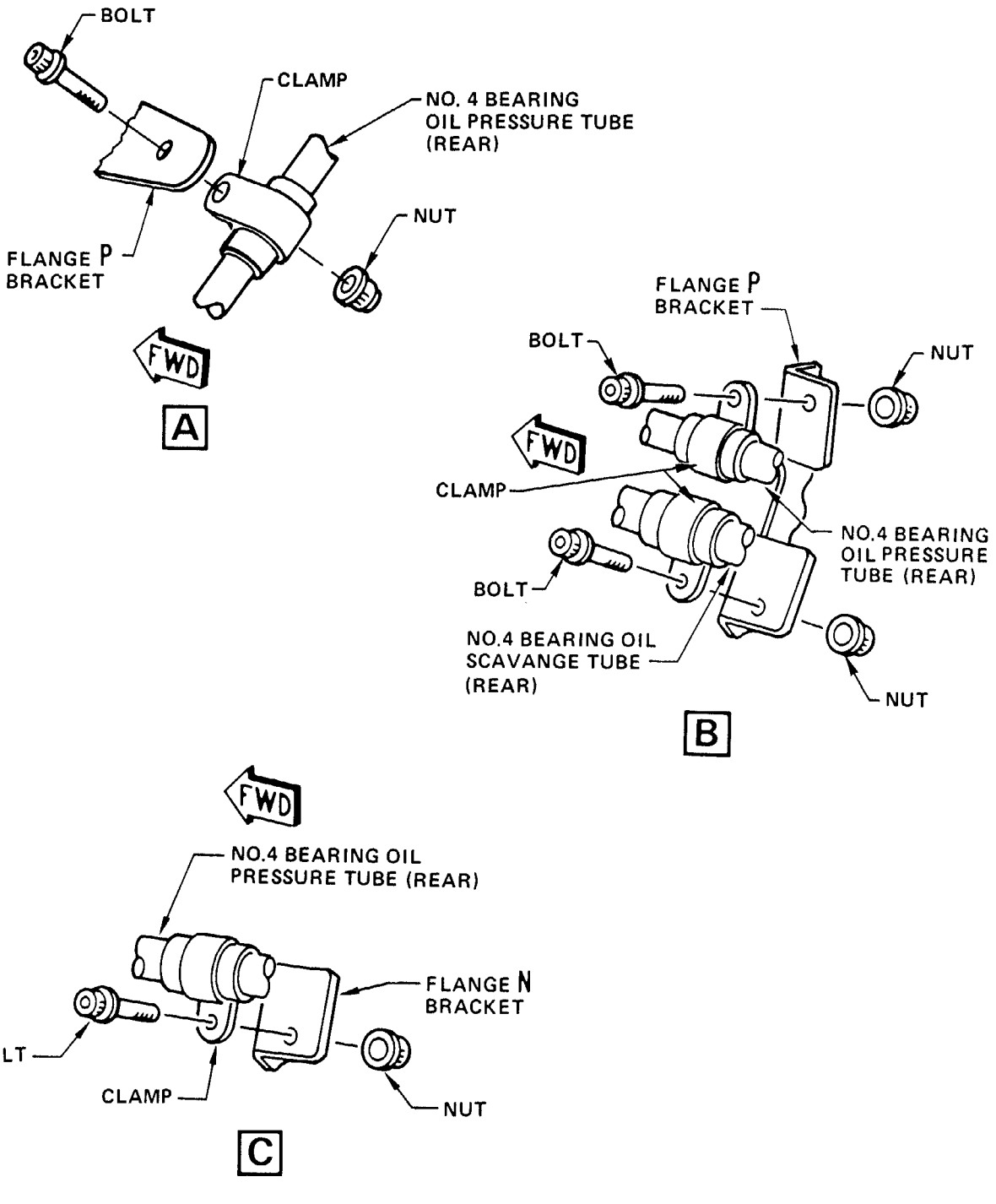
BM5 75 23 09 4 KAMA 00

LPT Turbine Case Cooling (TCC) Plumbing (Left Side)
(Sheet 1/9)
Figure 401



BM5 75 23 09 4 KAMM 00

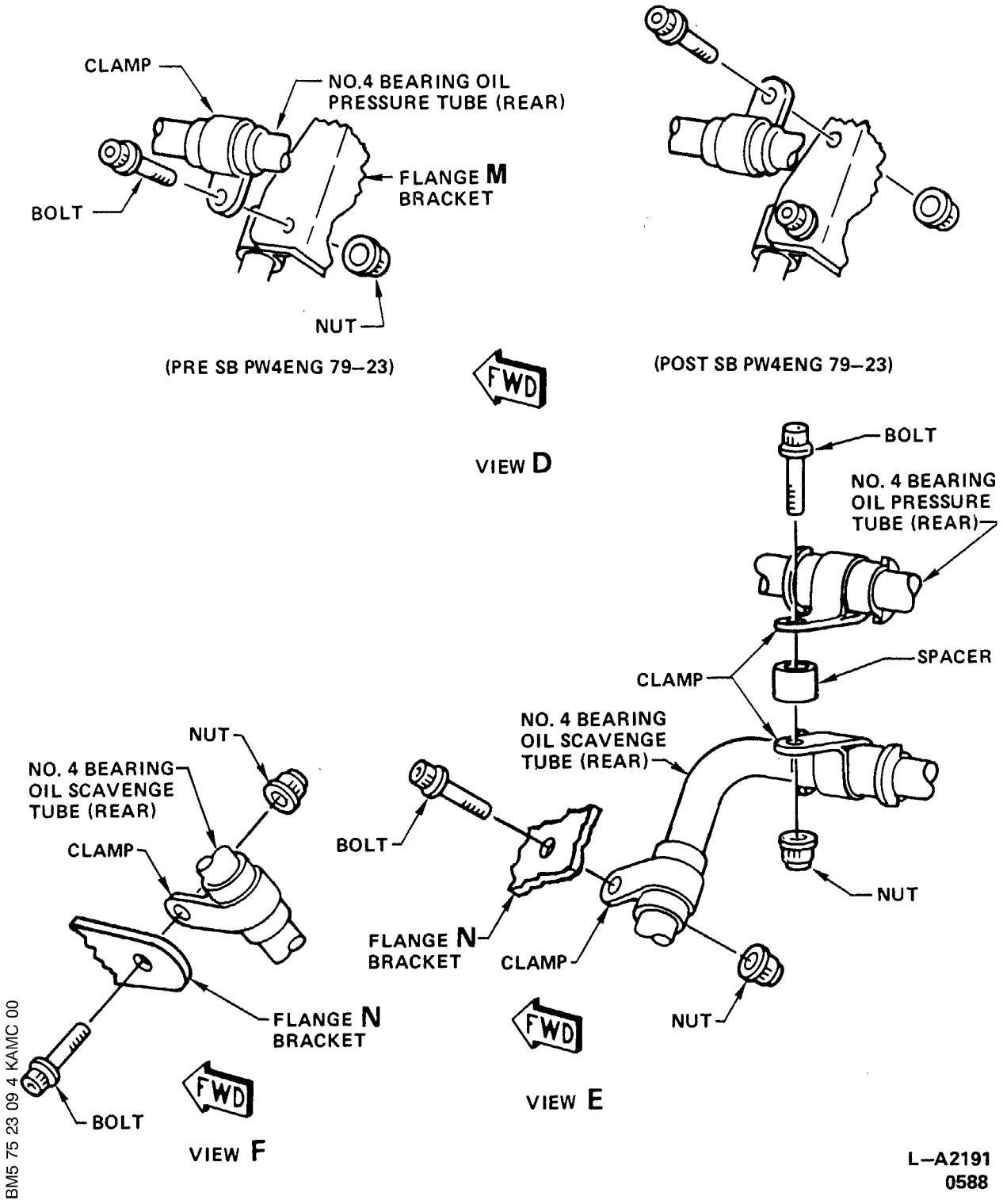
LPT Turbine Case Cooling (TCC) Plumbing (Left Side)
(Sheet 2/9)
Figure 401



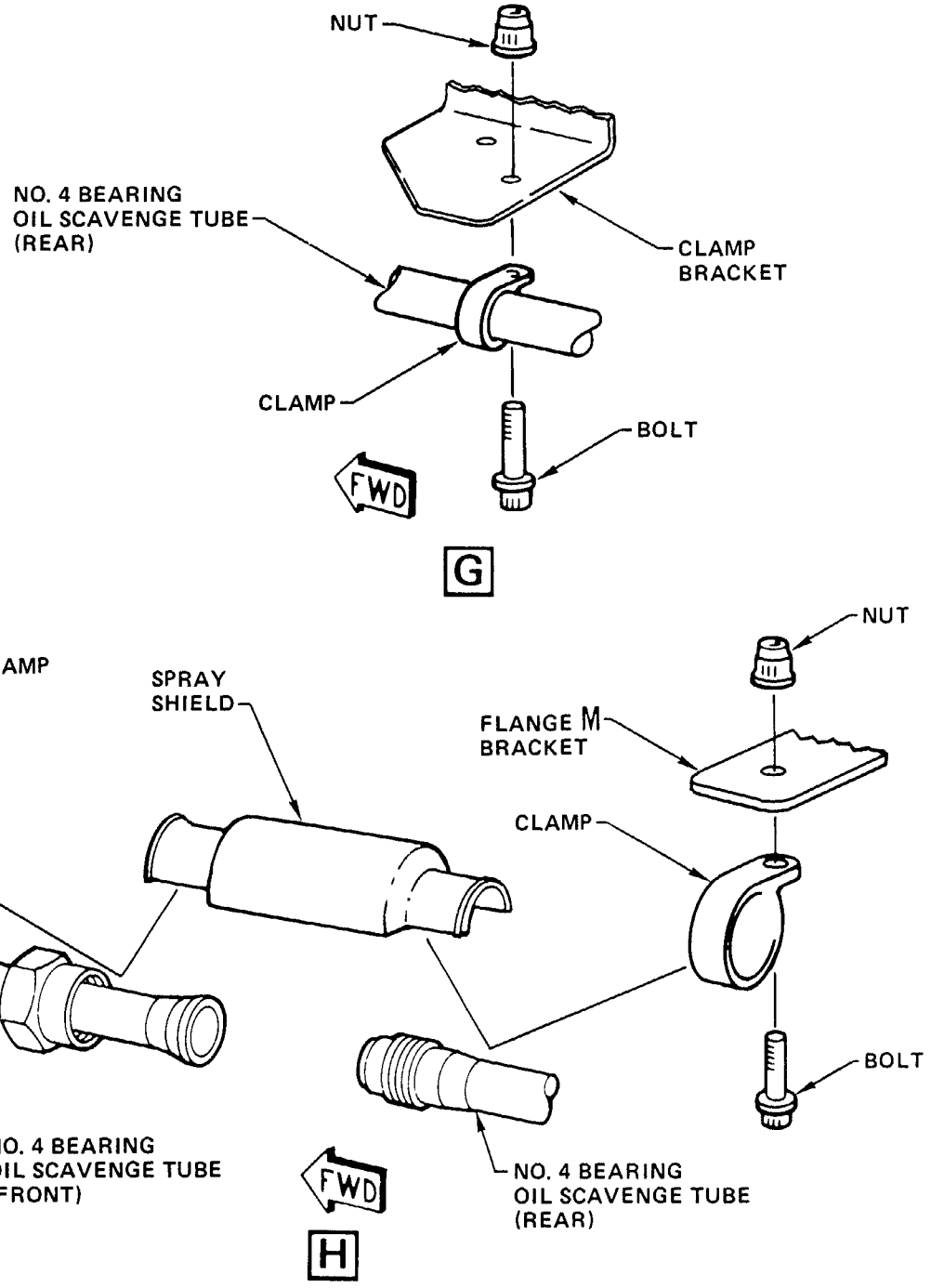
BM5 75 23 09 4 KAMB 00

L – A2190
0487

LPT Turbine Case Cooling (TCC) Plumbing (Left Side)
(Sheet 3/9)
Figure 401



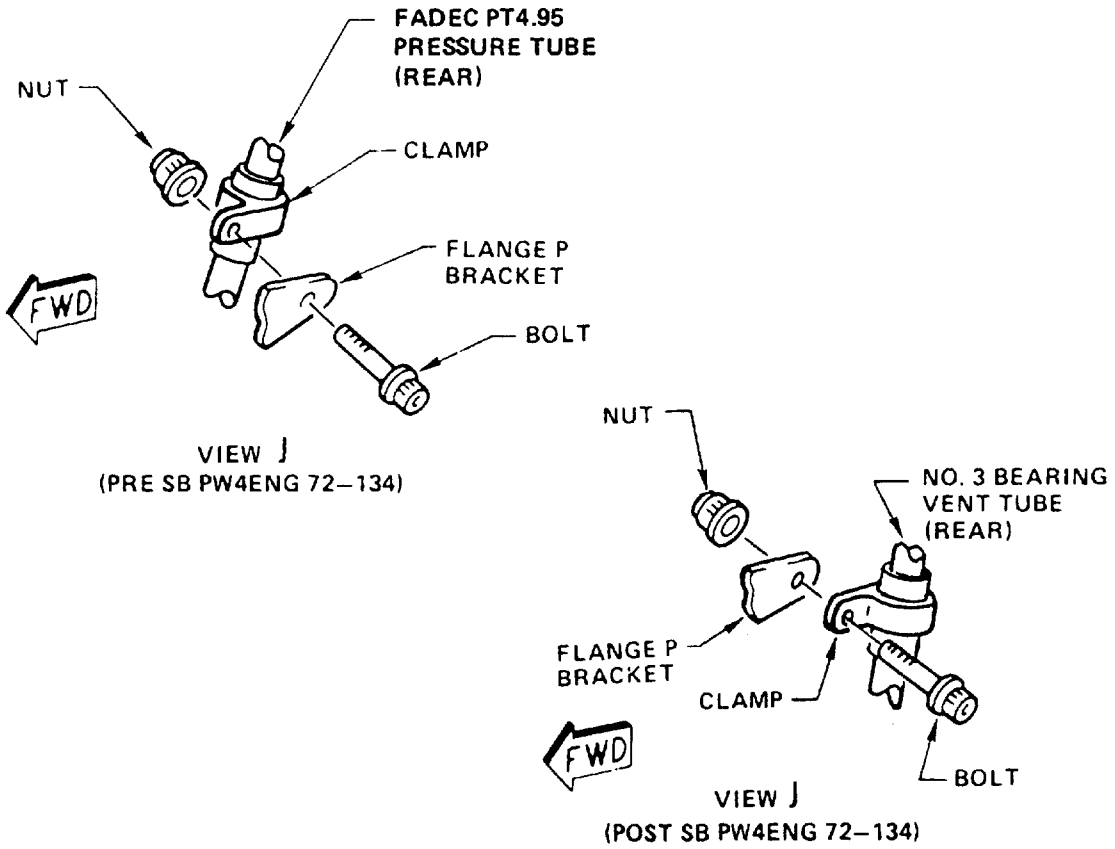
LPT Turbine Case Cooling (TCC) Plumbing (Left Side)
(Sheet 4/9)
Figure 401



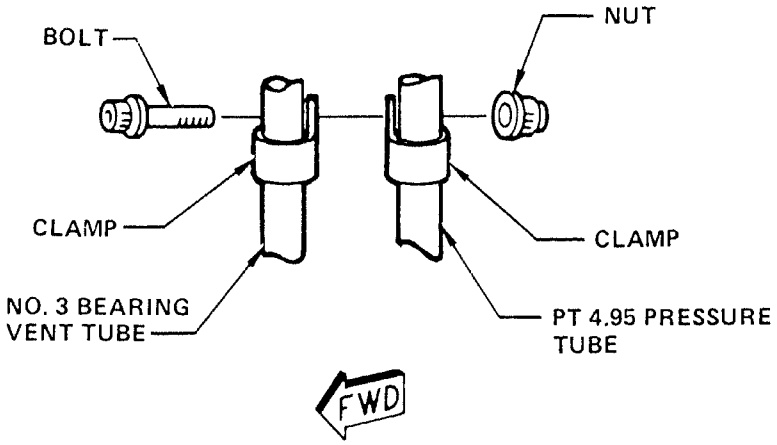
BM5 75 23 09 4 KAMD 00

L – A2192
0487

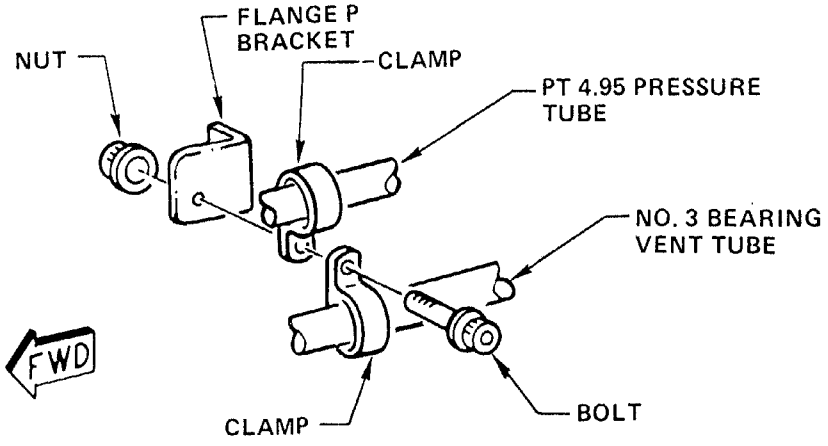
LPT Turbine Case Cooling (TCC) Plumbing (Left Side)
(Sheet 5/9)
Figure 401



LPT Turbine Case Cooling (TCC) Plumbing (Left Side)
(Sheet 6/9)
Figure 401



VIEW K
(POST SB PW4ENG 72–134)

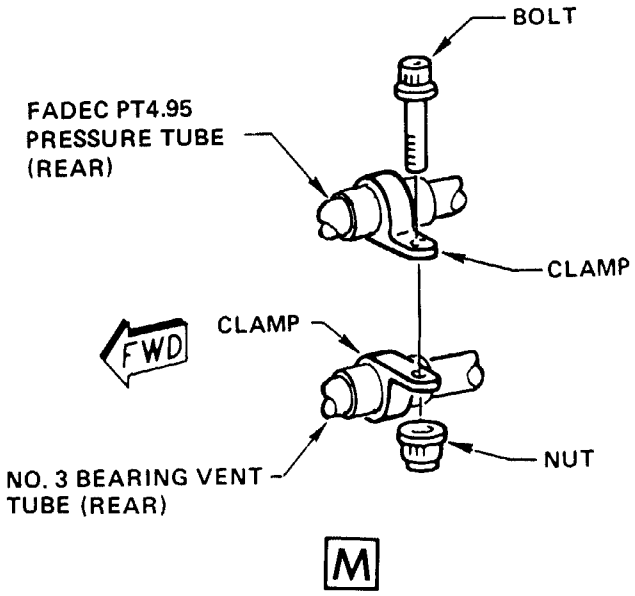


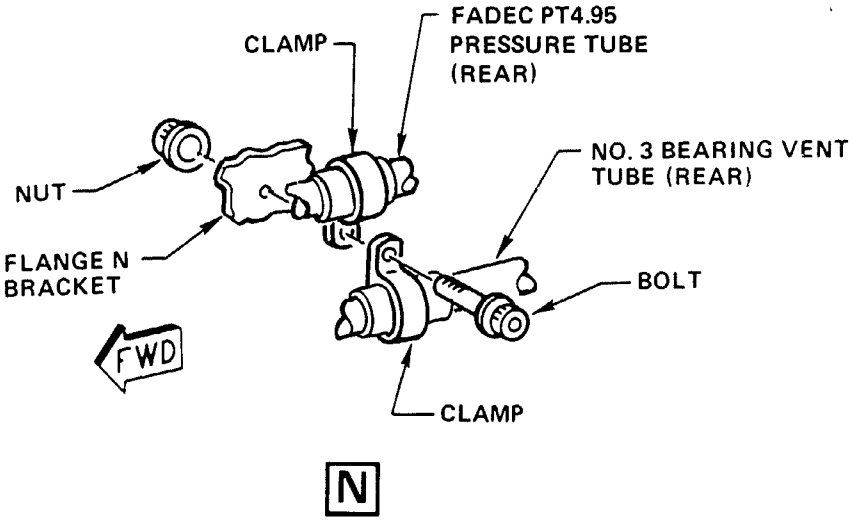
VIEW L

L–A5024

BM5 75 23 09 4 KAMG 00

LPT Turbine Case Cooling (TCC) Plumbing (Left Side)
(Sheet 7/9)
Figure 401

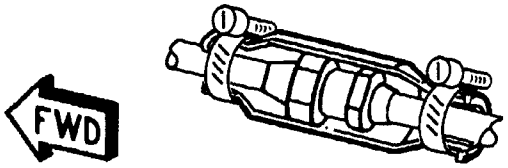




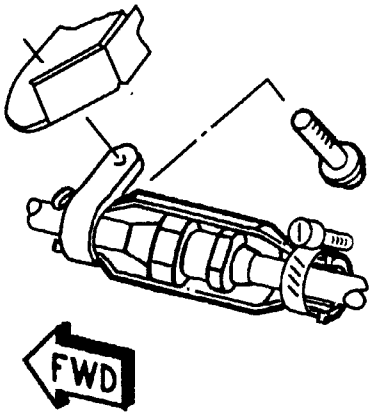
BM5 75 23 09 4 KAMF 00

L – A2194
0487

LPT Turbine Case Cooling (TCC) Plumbing (Left Side)
(Sheet 8/9)
Figure 401



VIEW P
(PRE SB PW4ENG 79-54)

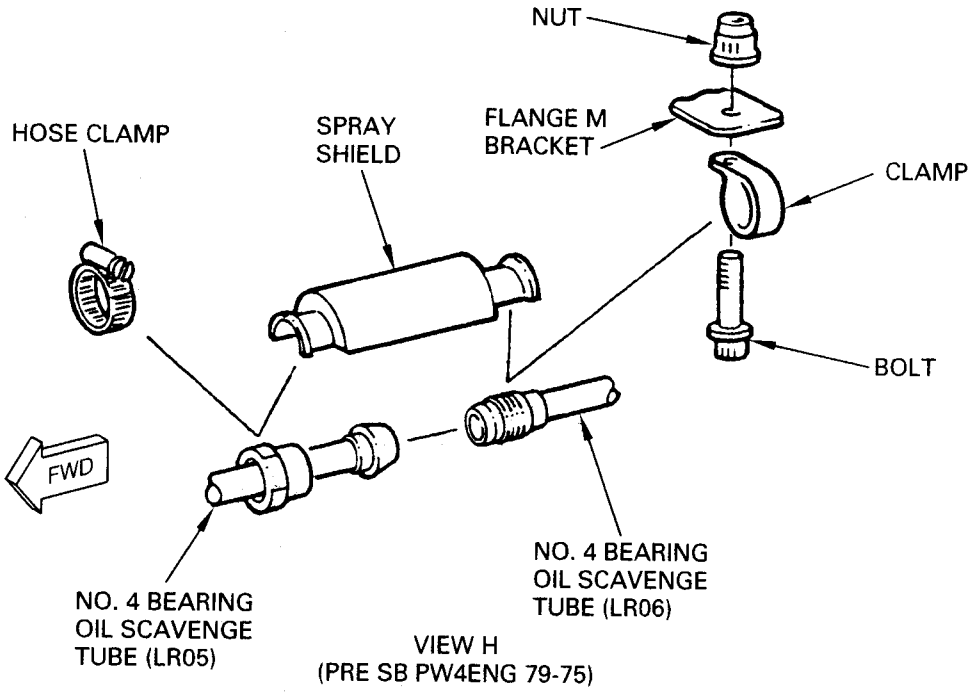


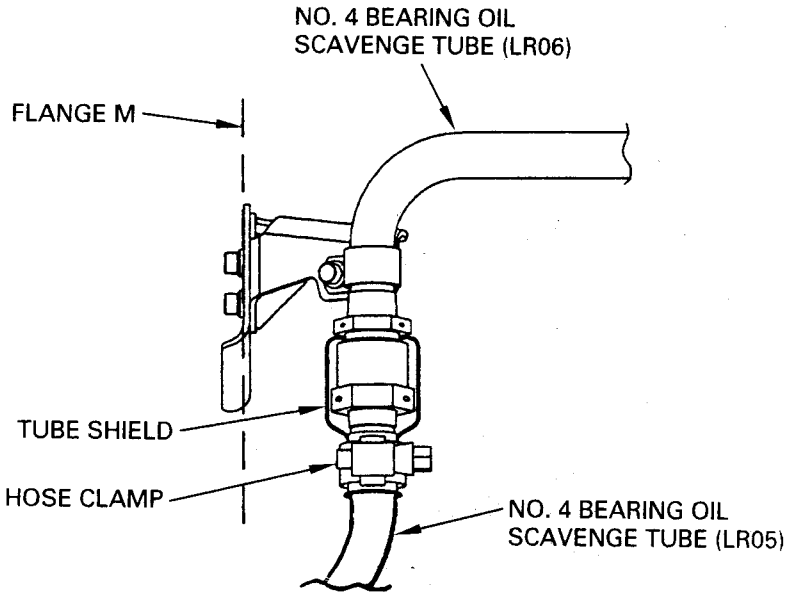
VIEW P
(POST SB PW4ENG 79-54)

L-A6824 (0000)

BM5 75 23 09 4 KAMJ 00

LPT Turbine Case Cooling (TCC) Plumbing (Left Side)
(Sheet 9/9)
Figure 401

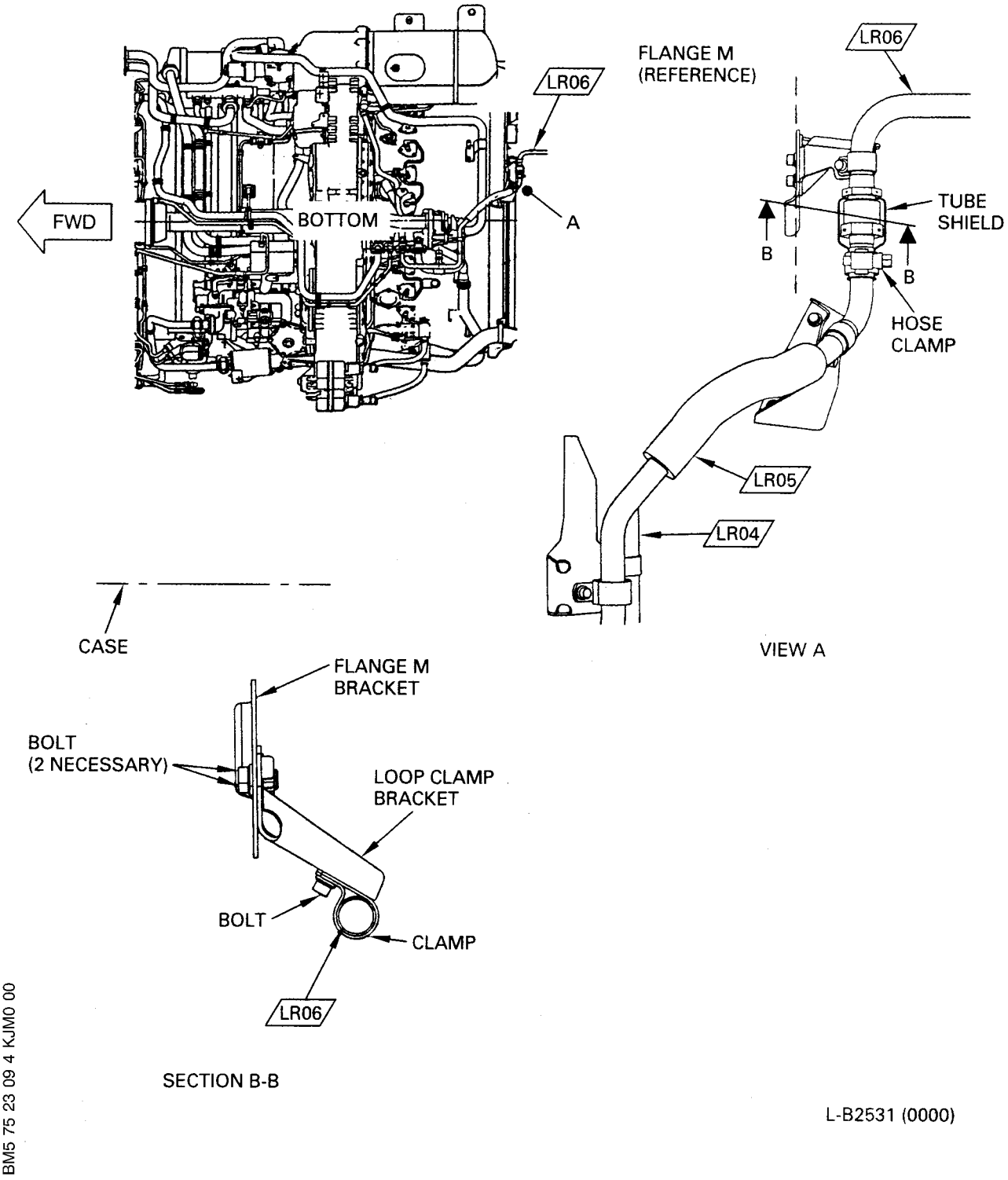




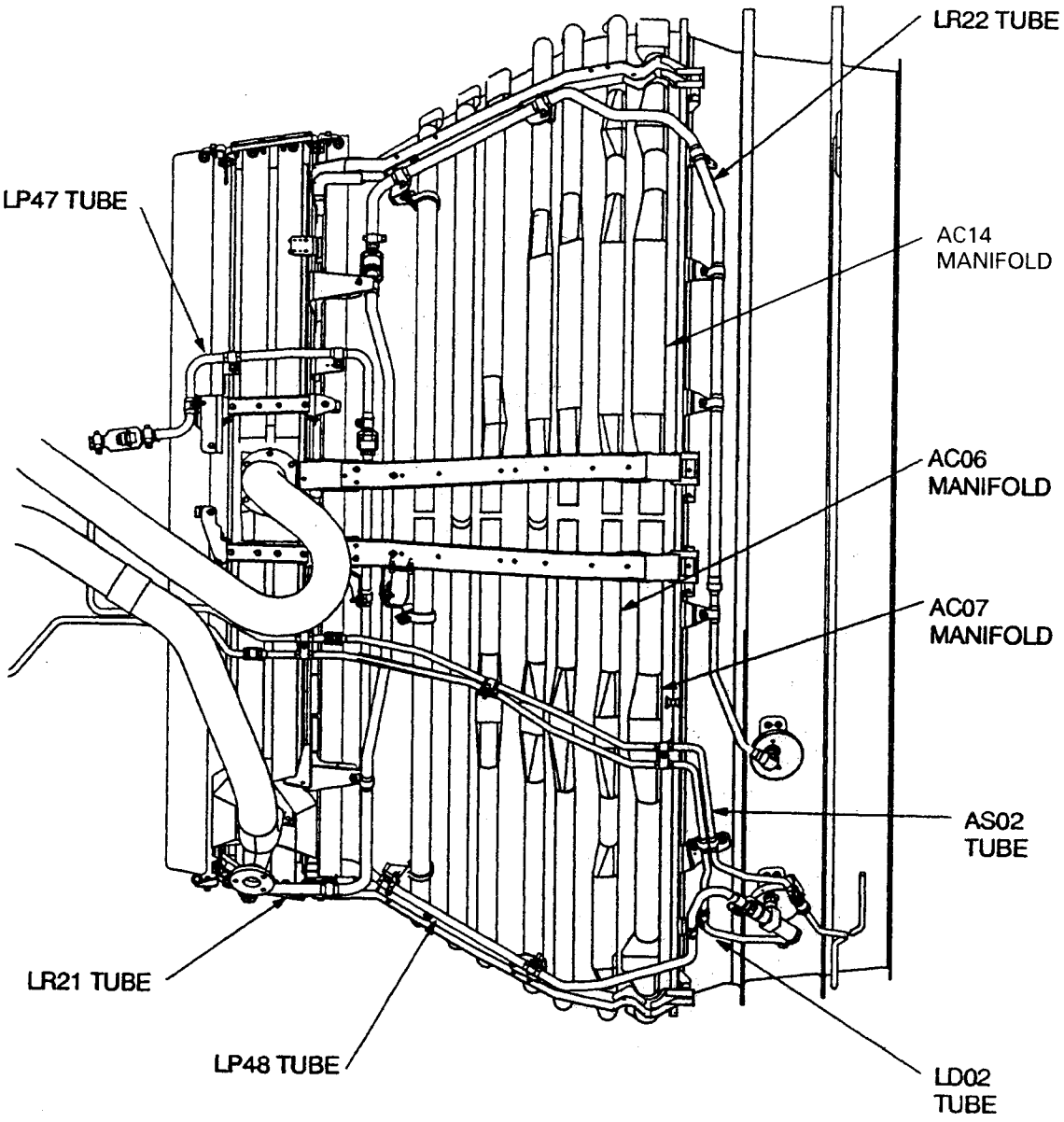
L-B2526 (0000)

BM5 75 23 09 4 KHM0 00

External Tube Clipping Views
Figure 402

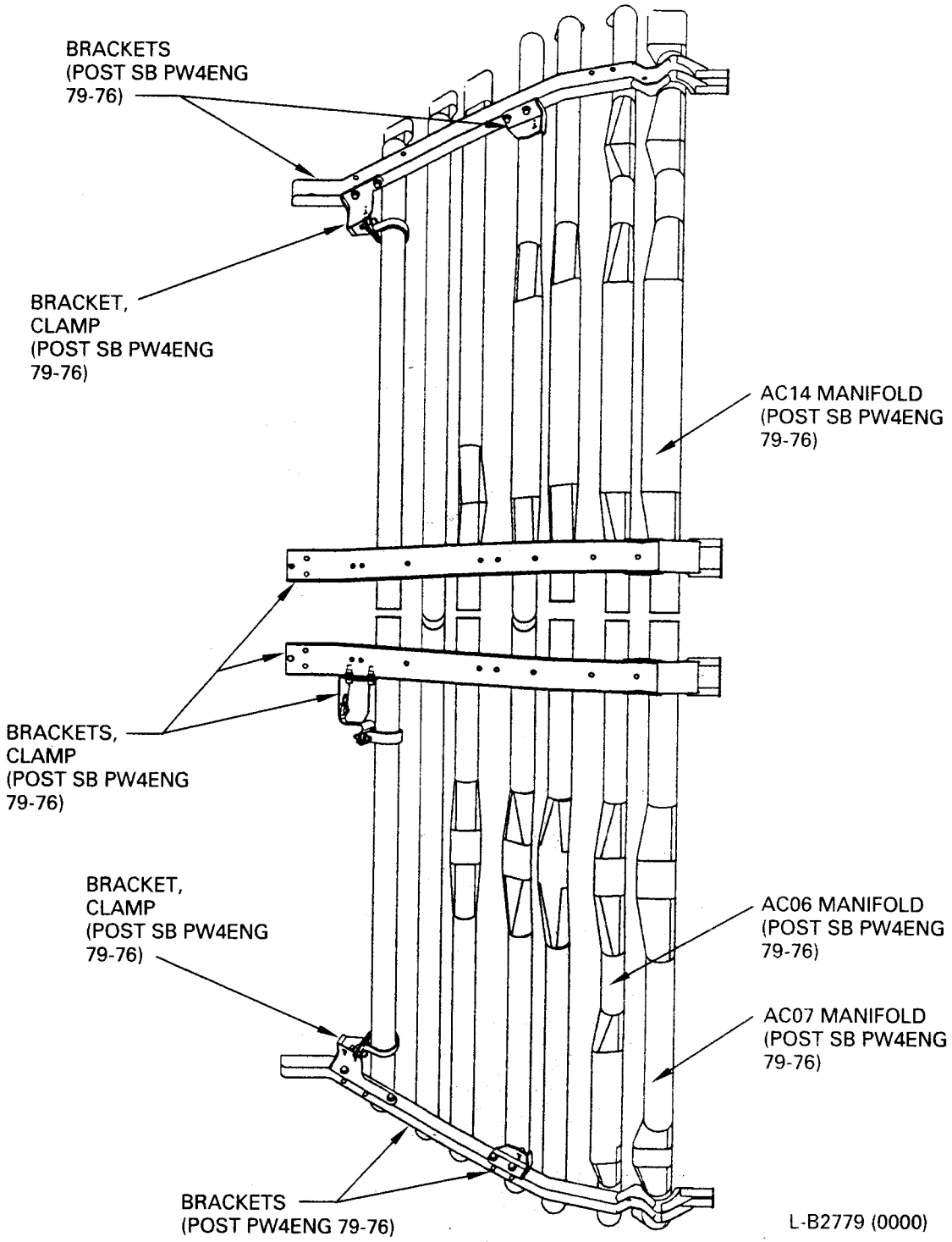


External Tubes Clipping Views
Figure 403



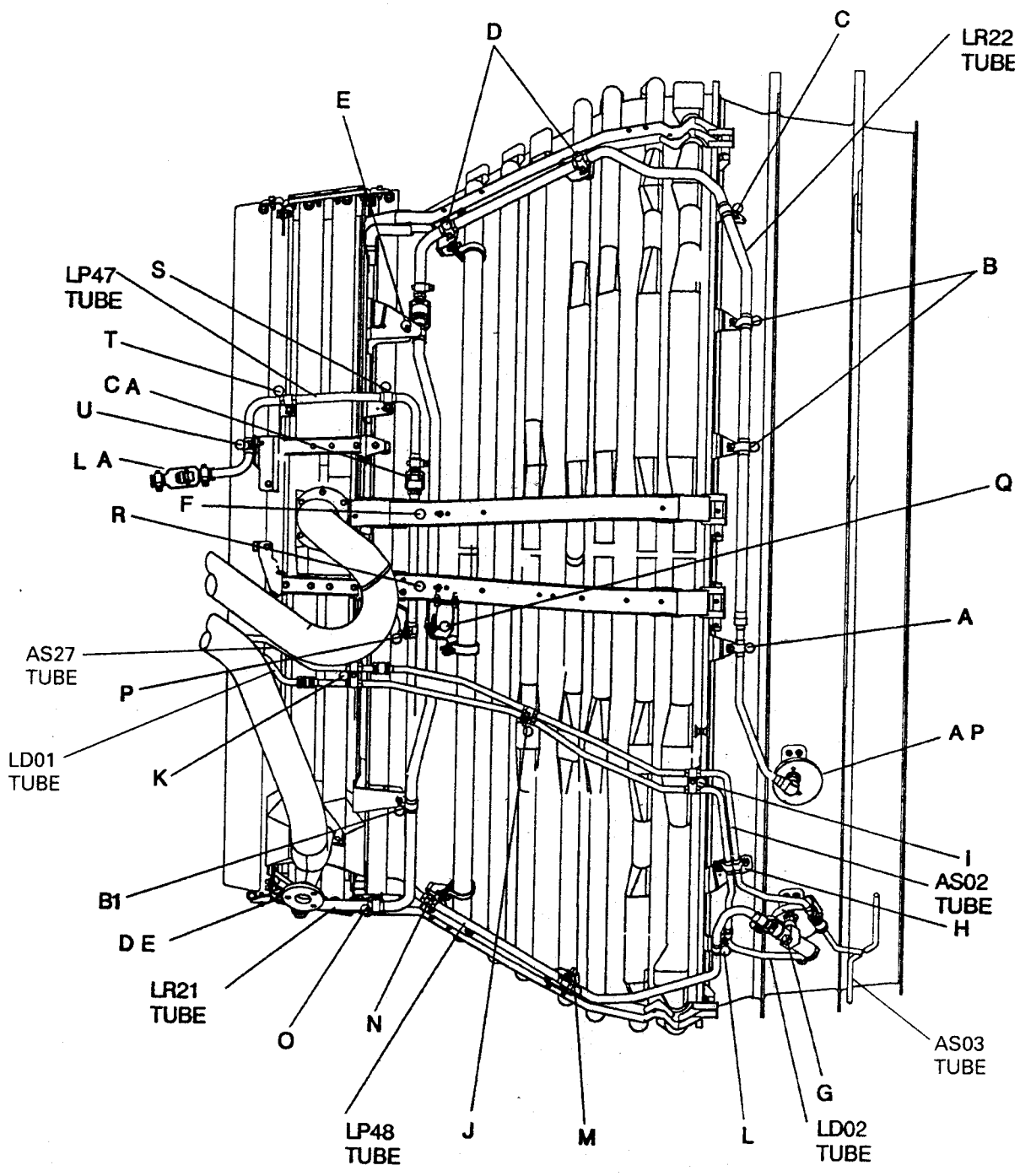
BM5 75 23 09 4 KKMA 00

LPT Turbine Case Cooling - Manifolds Clipping
(Post SB PW4ENG 79-76) (Sheet 1/2)
Figure 404



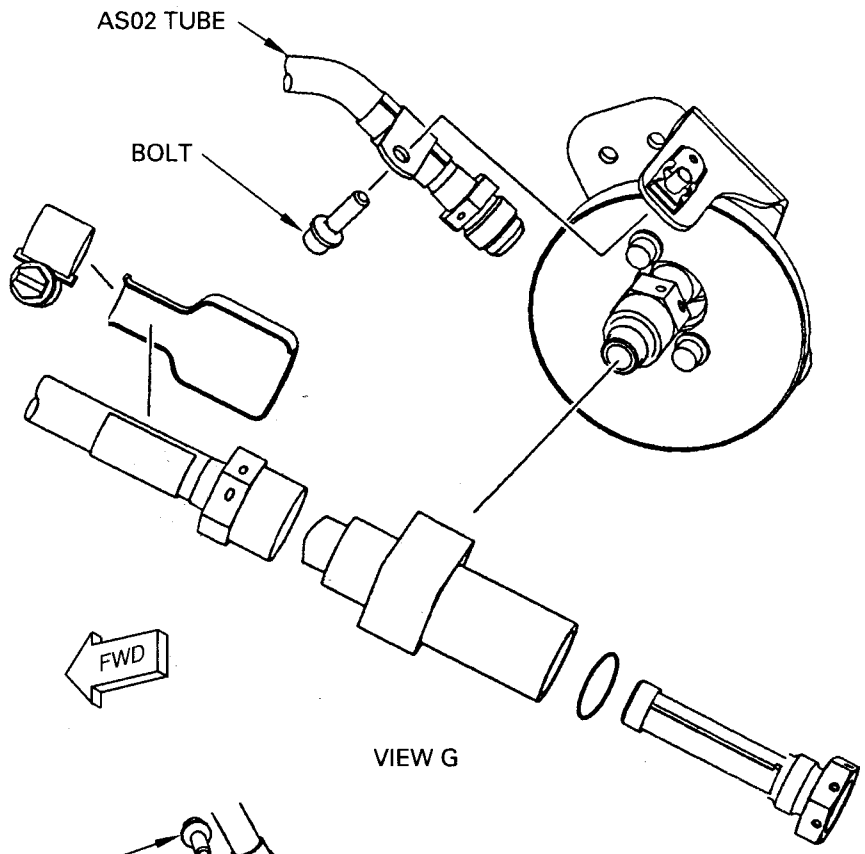
BM5 75 23 09 4 KKMJ 00

LPT Turbine Case Cooling - Manifolds Clipping
(Post SB PW4ENG 79-76) (Sheet 2/2)
Figure 404

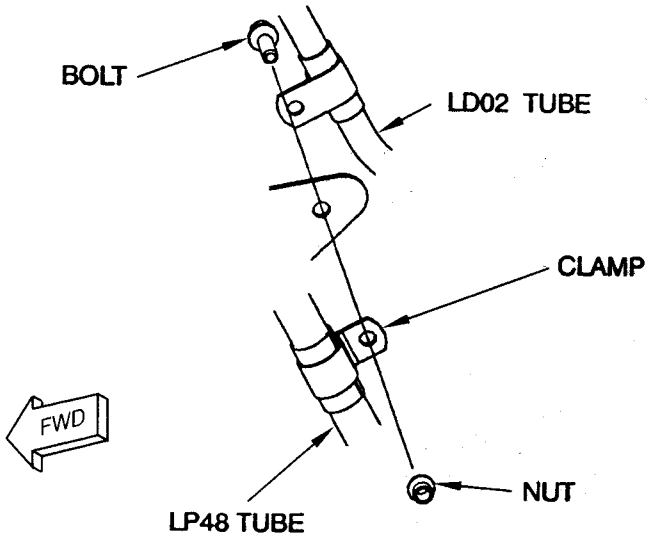


BM5 75 23 09 4 KLMA 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 1/12)
Figure 405



VIEW G

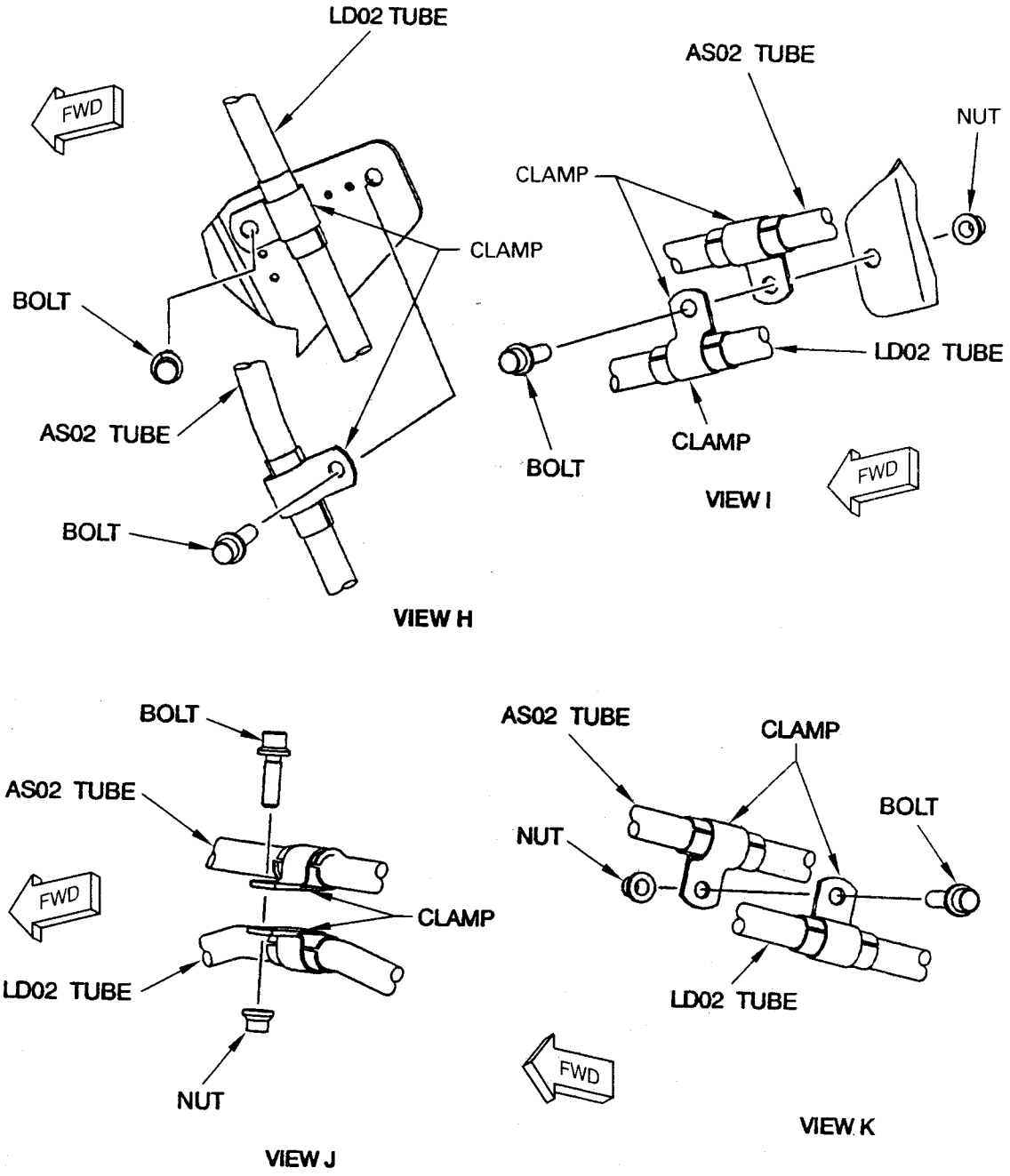


VIEW L

L-B2793 (0000)

BM5 75 23 09 4 KLMB 00

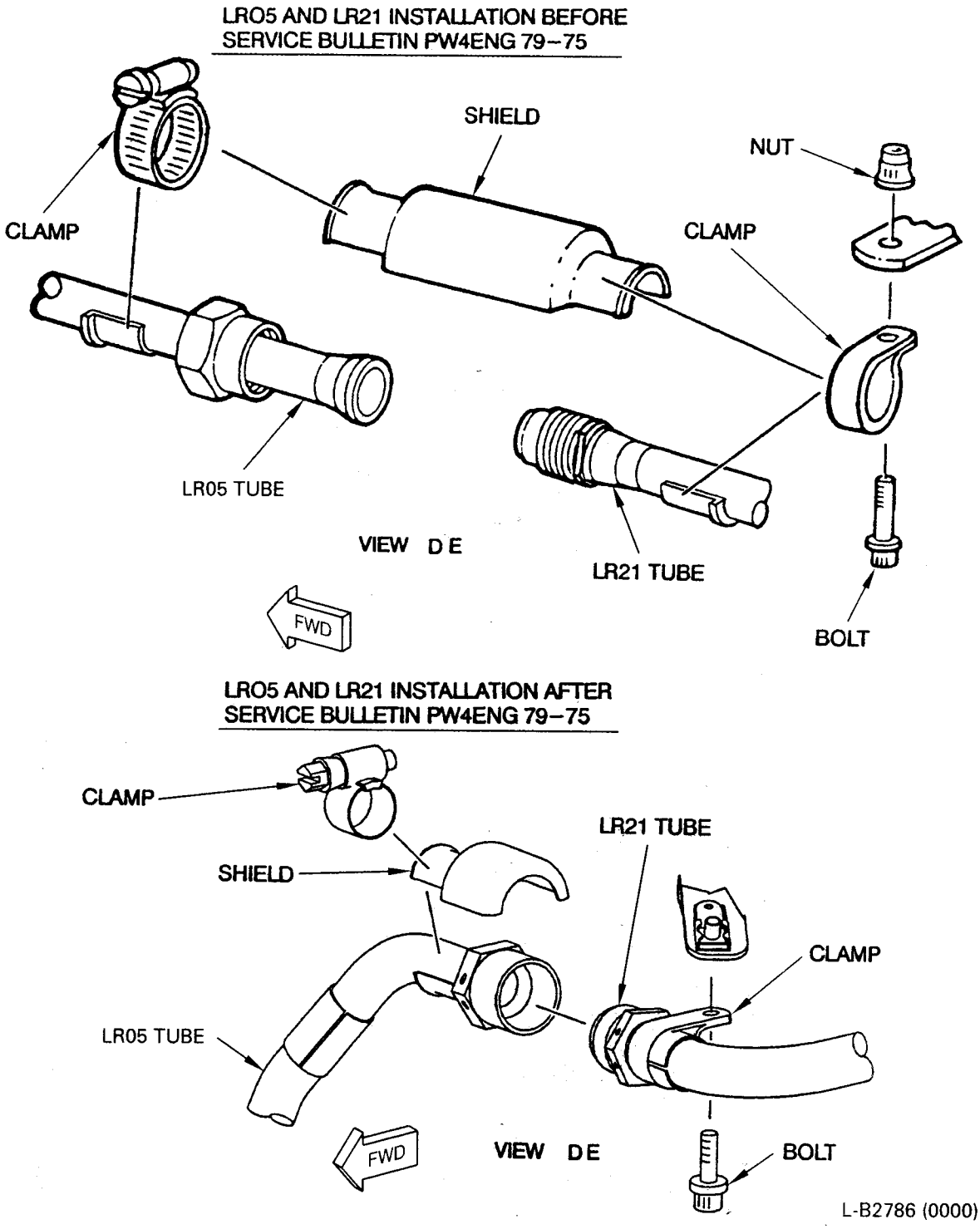
External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 2/12)
Figure 405



L-B2794 (0000)

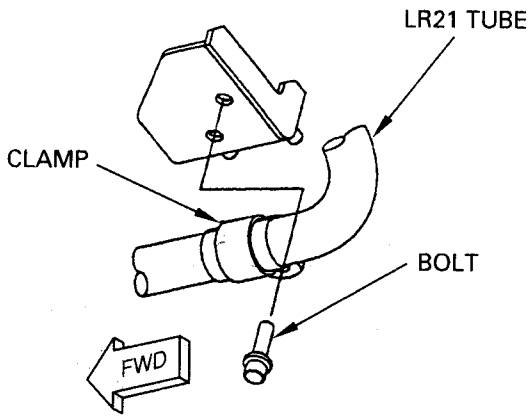
BM5 75 23 09 4 KLMC 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 3/12)
Figure 405

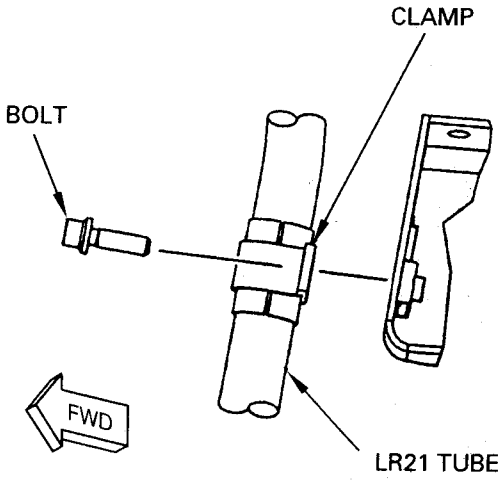


BM5 75 23 09 4 KLMD 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 4/12)
Figure 405



VIEW O

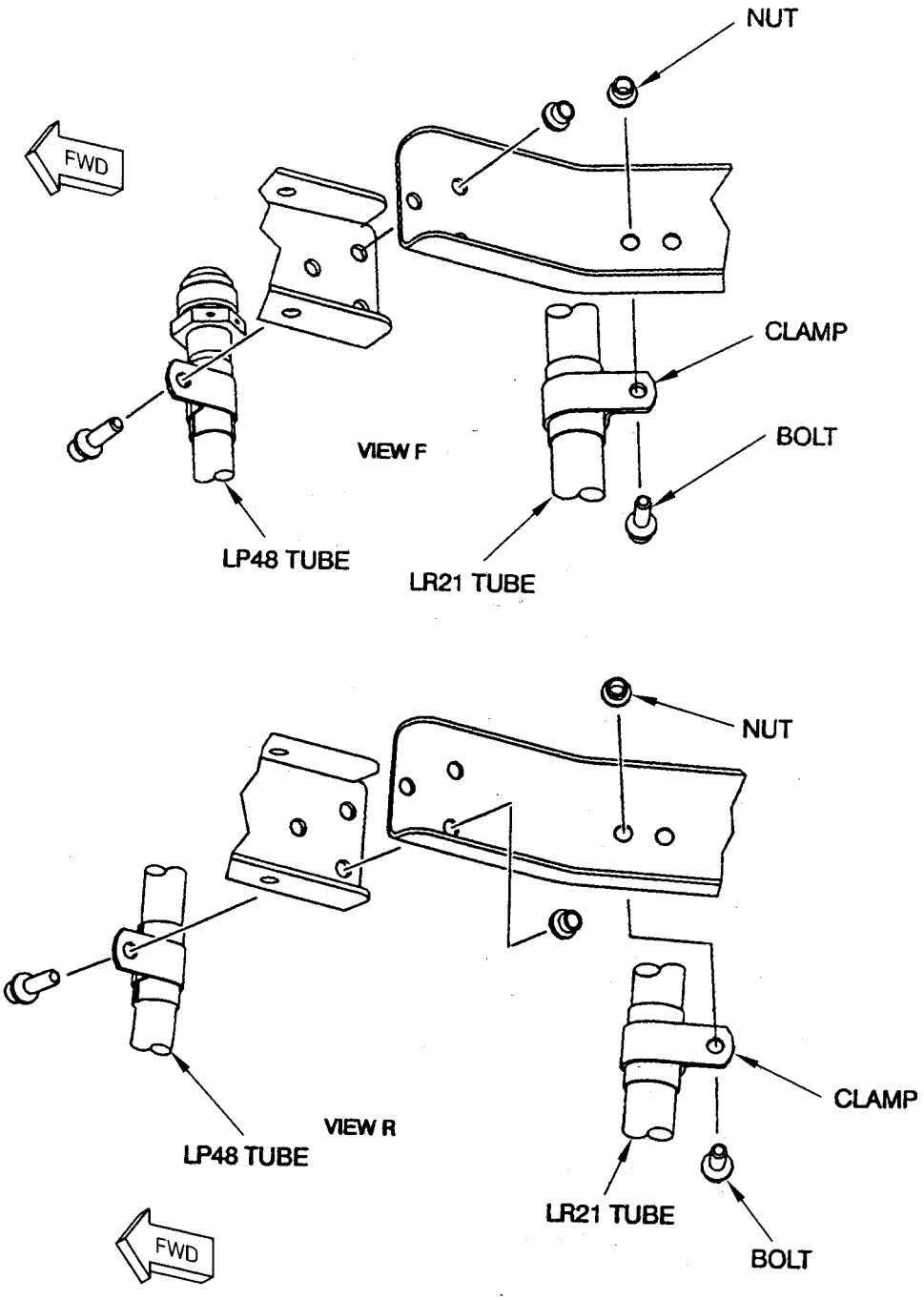


VIEW Q

BM5 75 23 09 4 KLME 00

L-B2787 (0000)

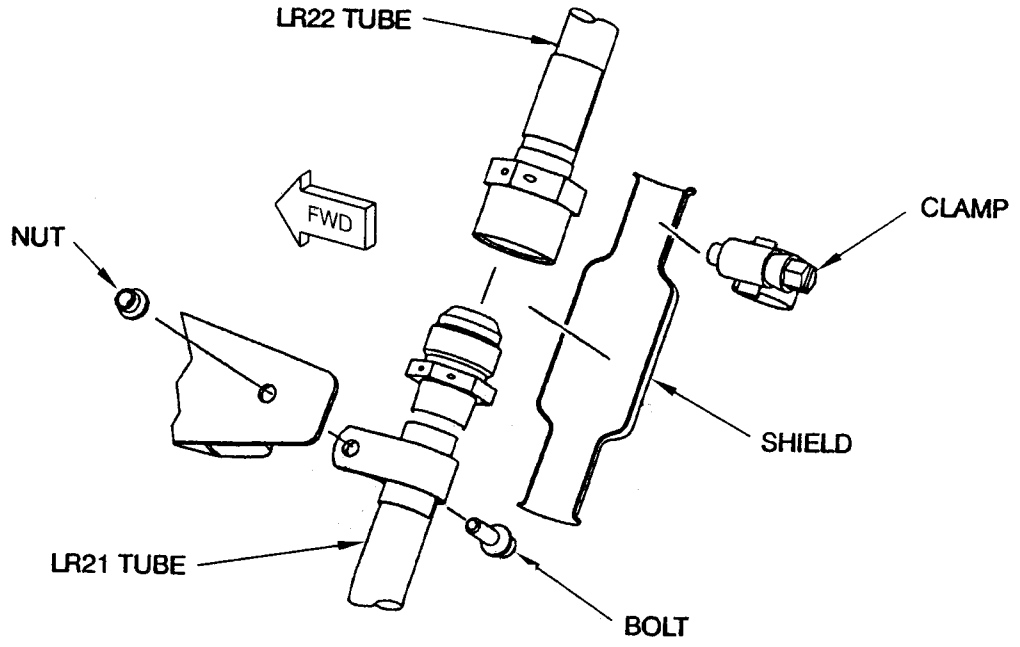
External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 5/12)
Figure 405



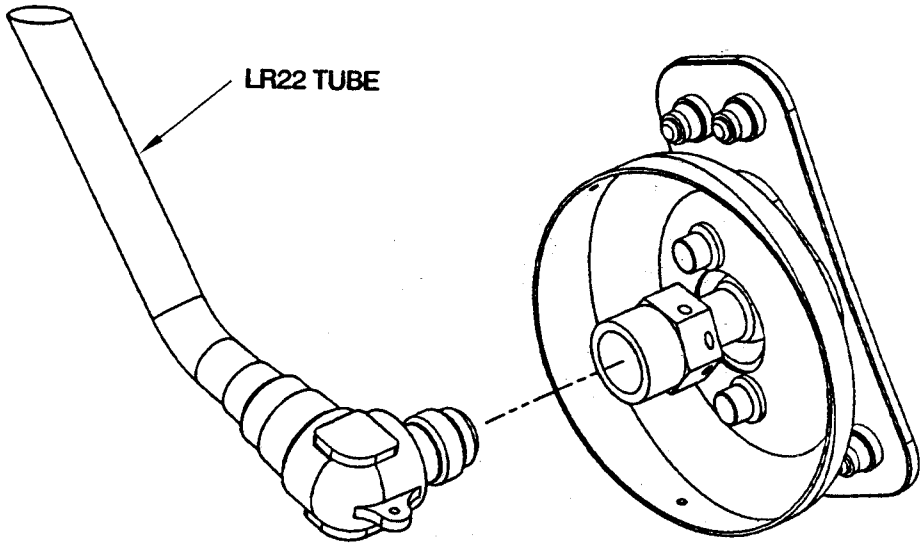
L-B2788 (0000)

BM5 75 23 09 4 KLMF 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 6/12)
Figure 405



VIEW E

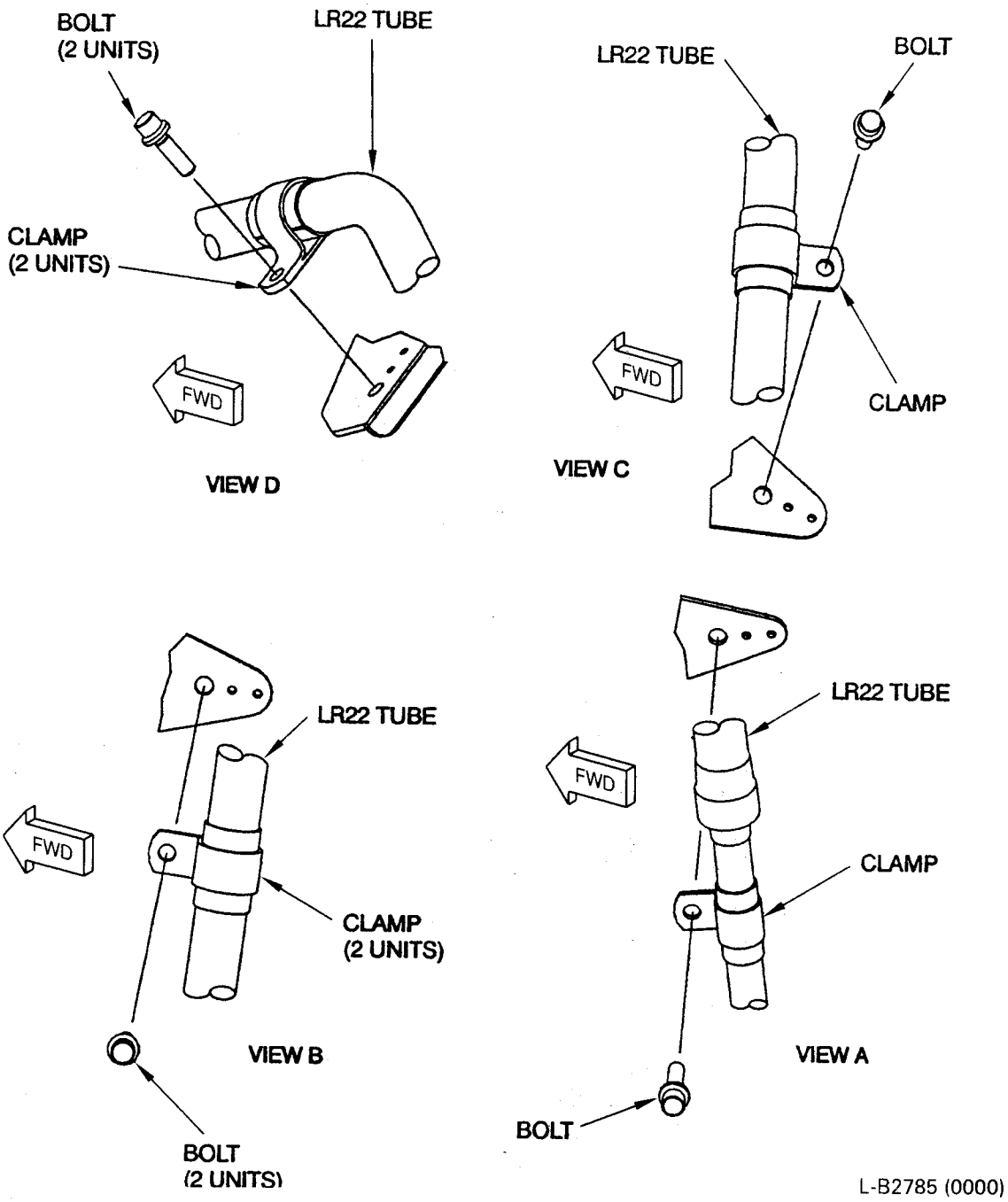


VIEW A P

L-B2784 (0000)

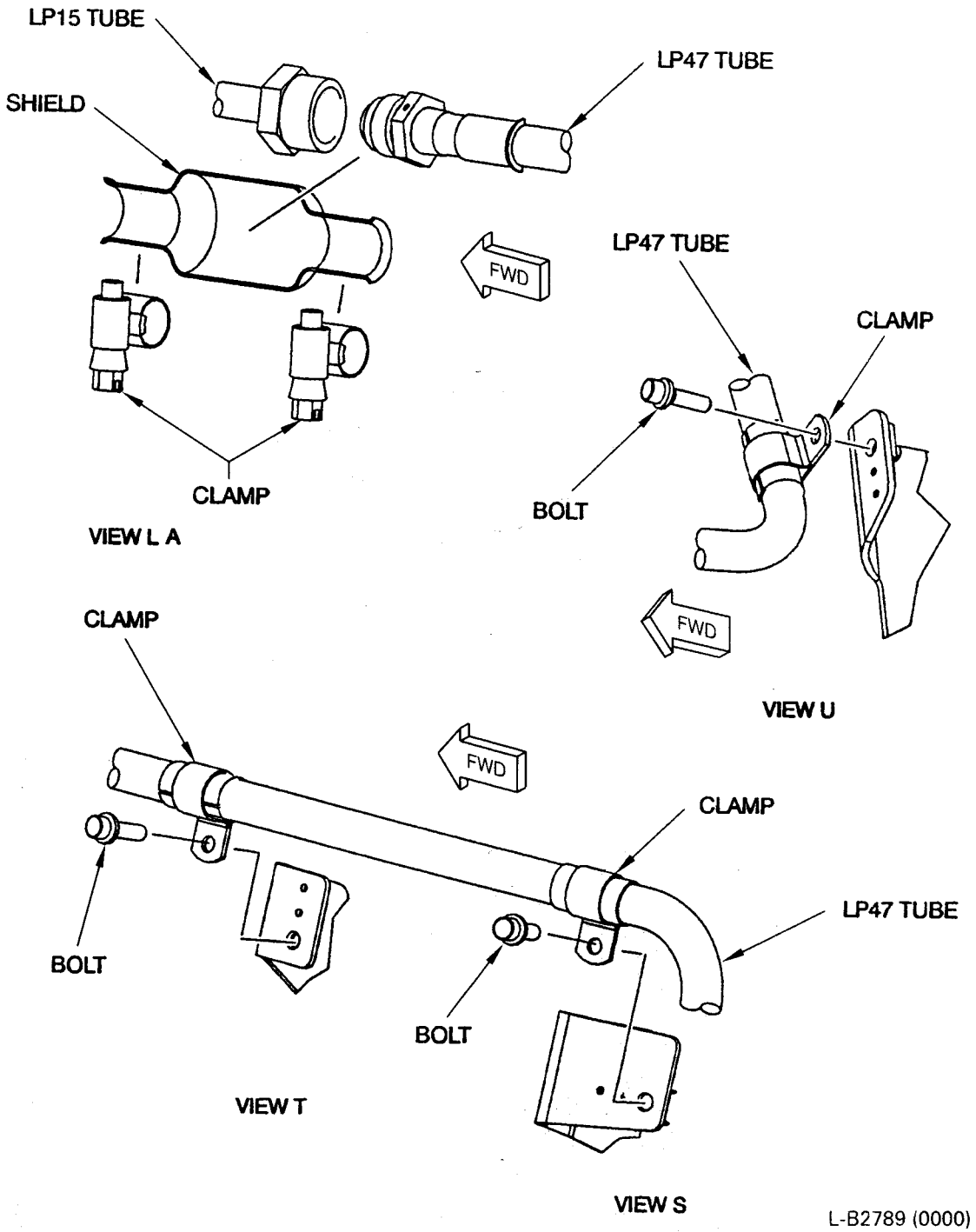
BM5 75 23 09 4 KLMG 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 7/12)
Figure 405



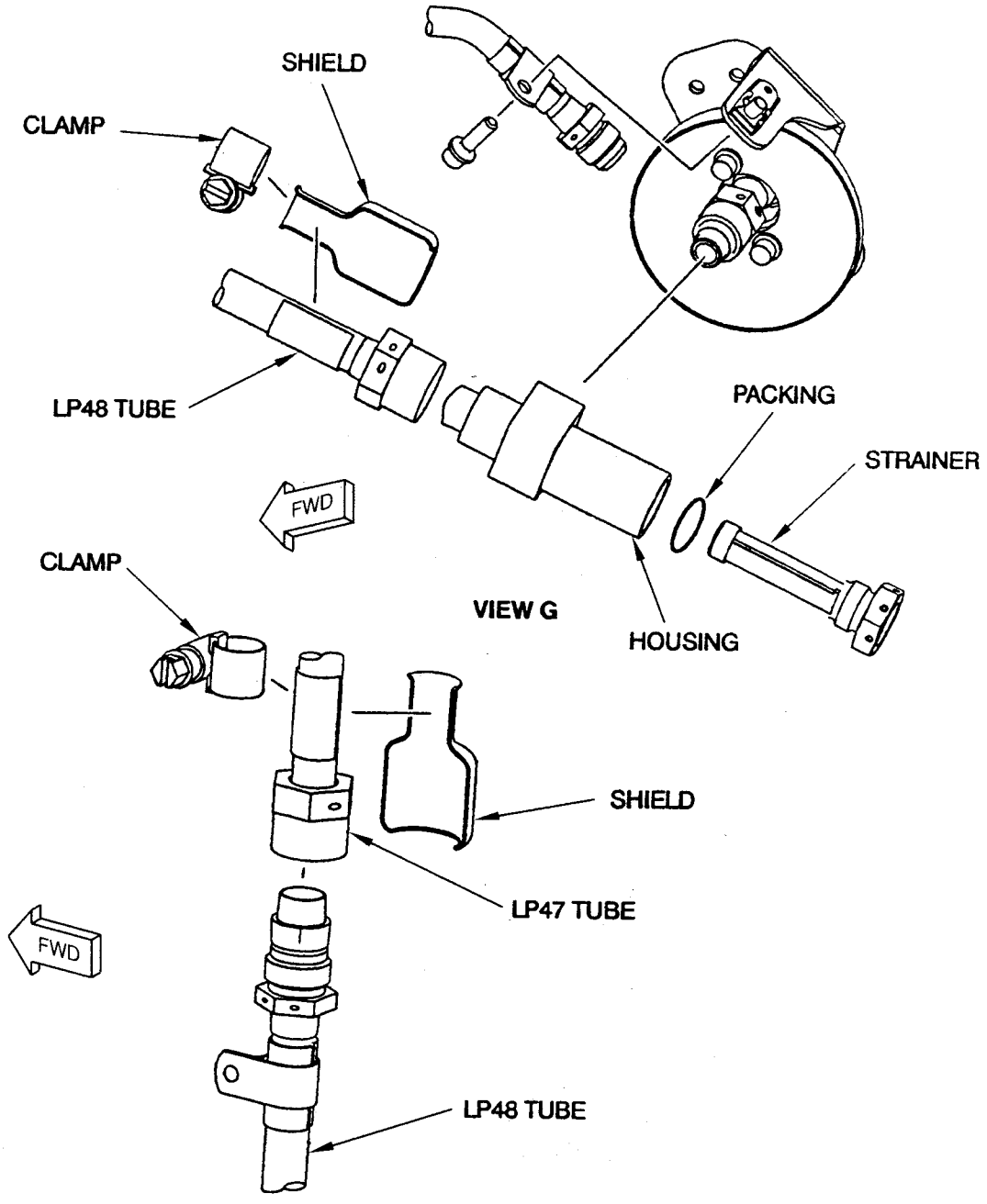
BM5 75 23 09 4 KLMH 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 8/12)
Figure 405



BM5 75 23 09 4 KLMJ 00

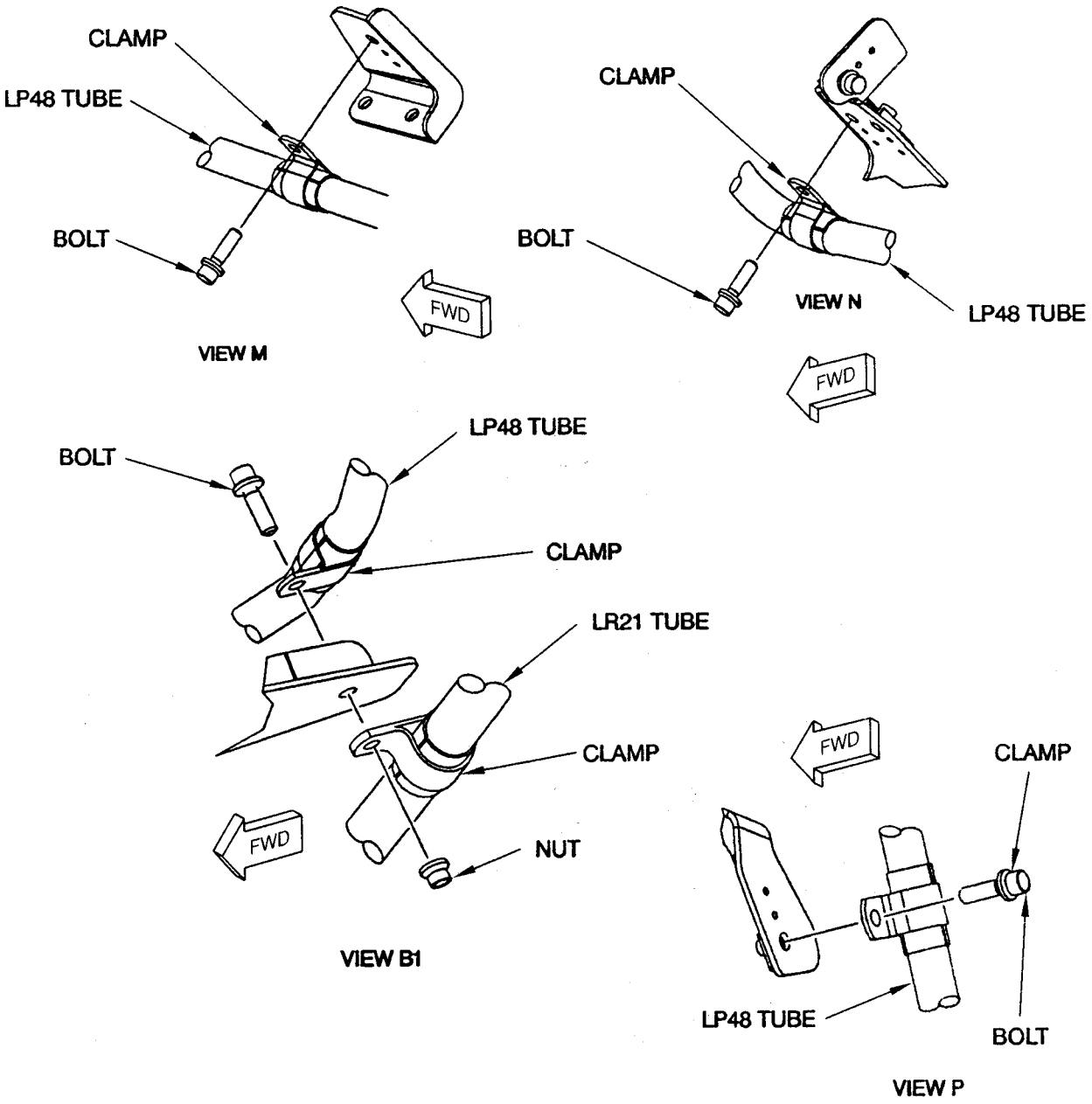
External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 9/12)
Figure 405



L-B2790 (0000)

BM5 75 23 09 4 KLMK 00

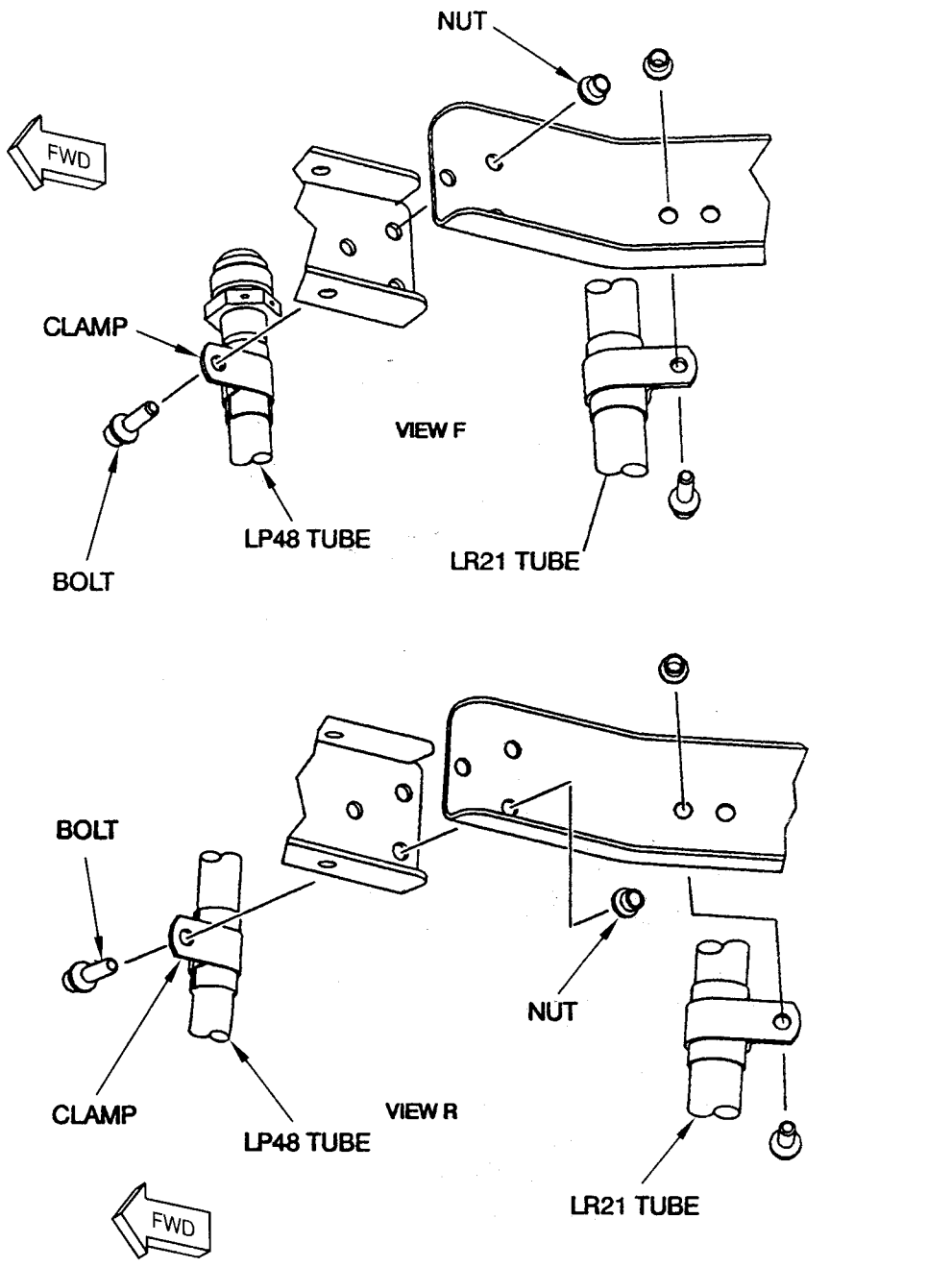
External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 10/12)
Figure 405



BM5 75 23 09 4 KLMM 00

L-B2791 (0000)

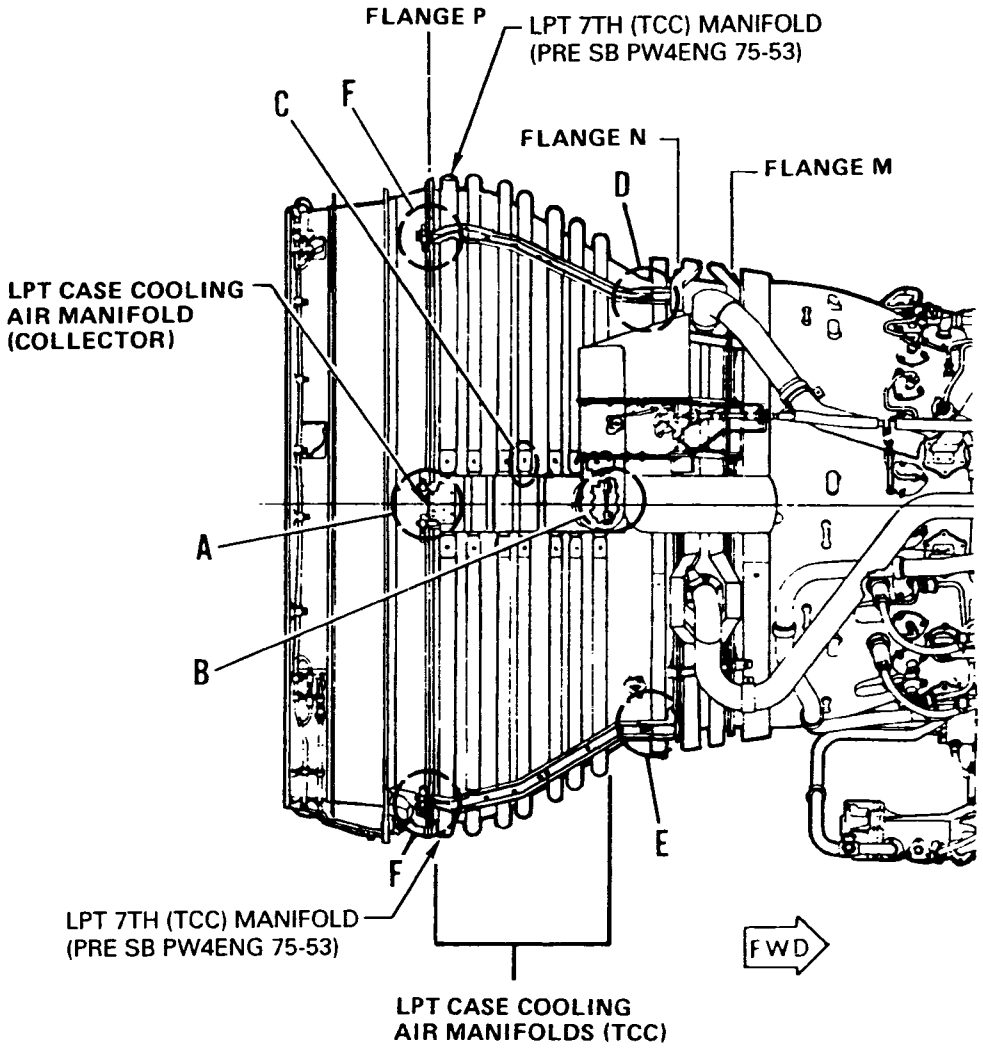
External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 11/12)
Figure 405



L-B2792 (0000)

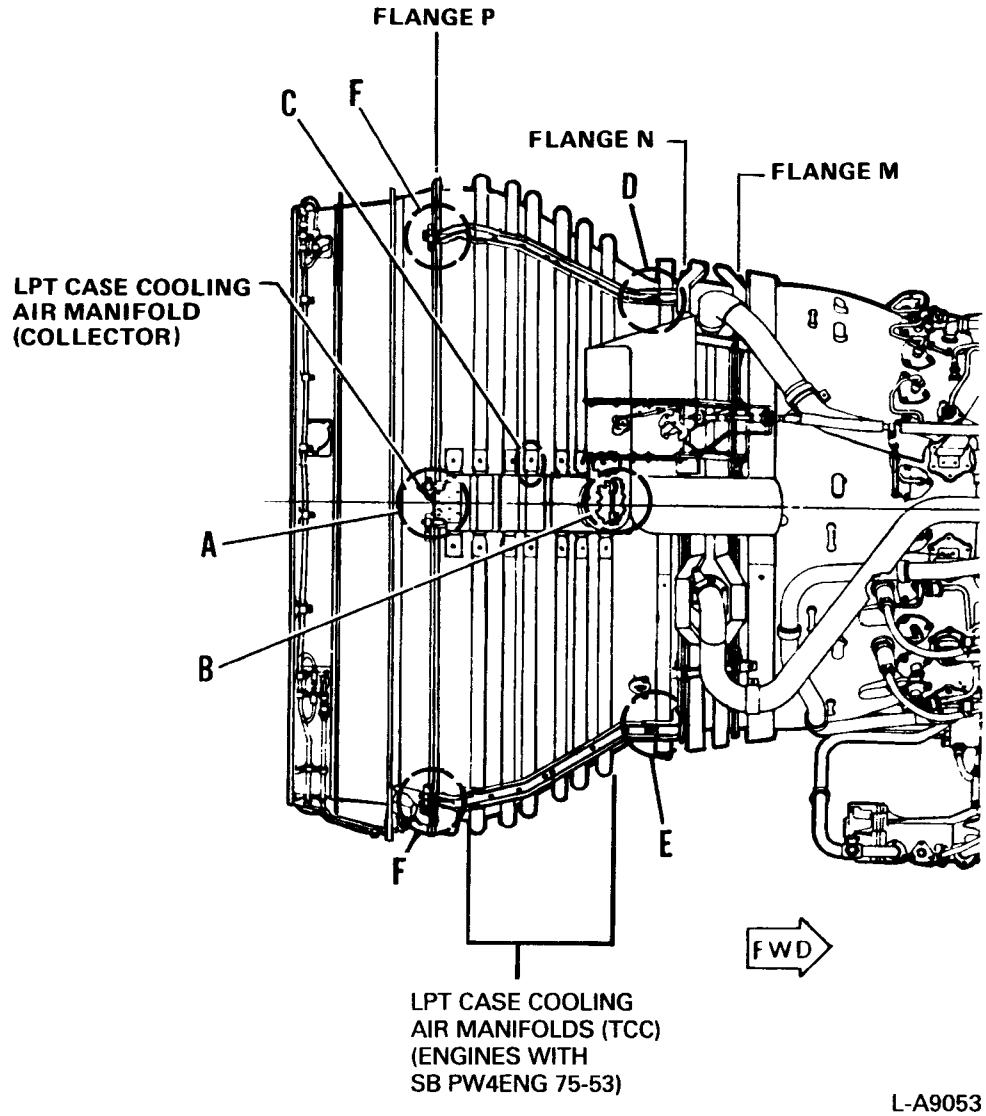
BM5 75 23 09 4 KLMN 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 12/12)
Figure 405



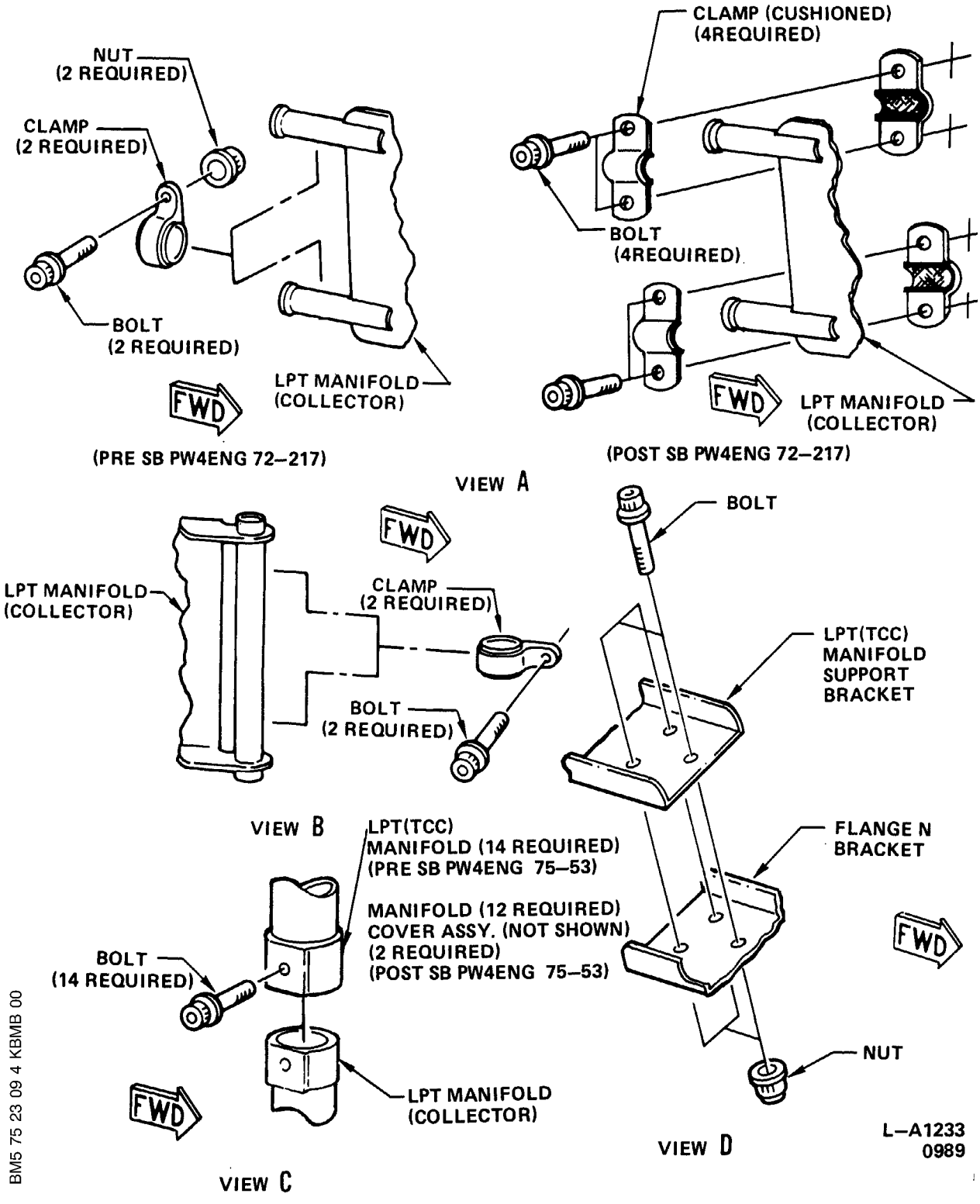
BM5 75 23 09 4 KBMA 00

LPT Turbine Case Cooling (TCC) Plumbing (Right Side)
(Sheet 1/7)
Figure 406

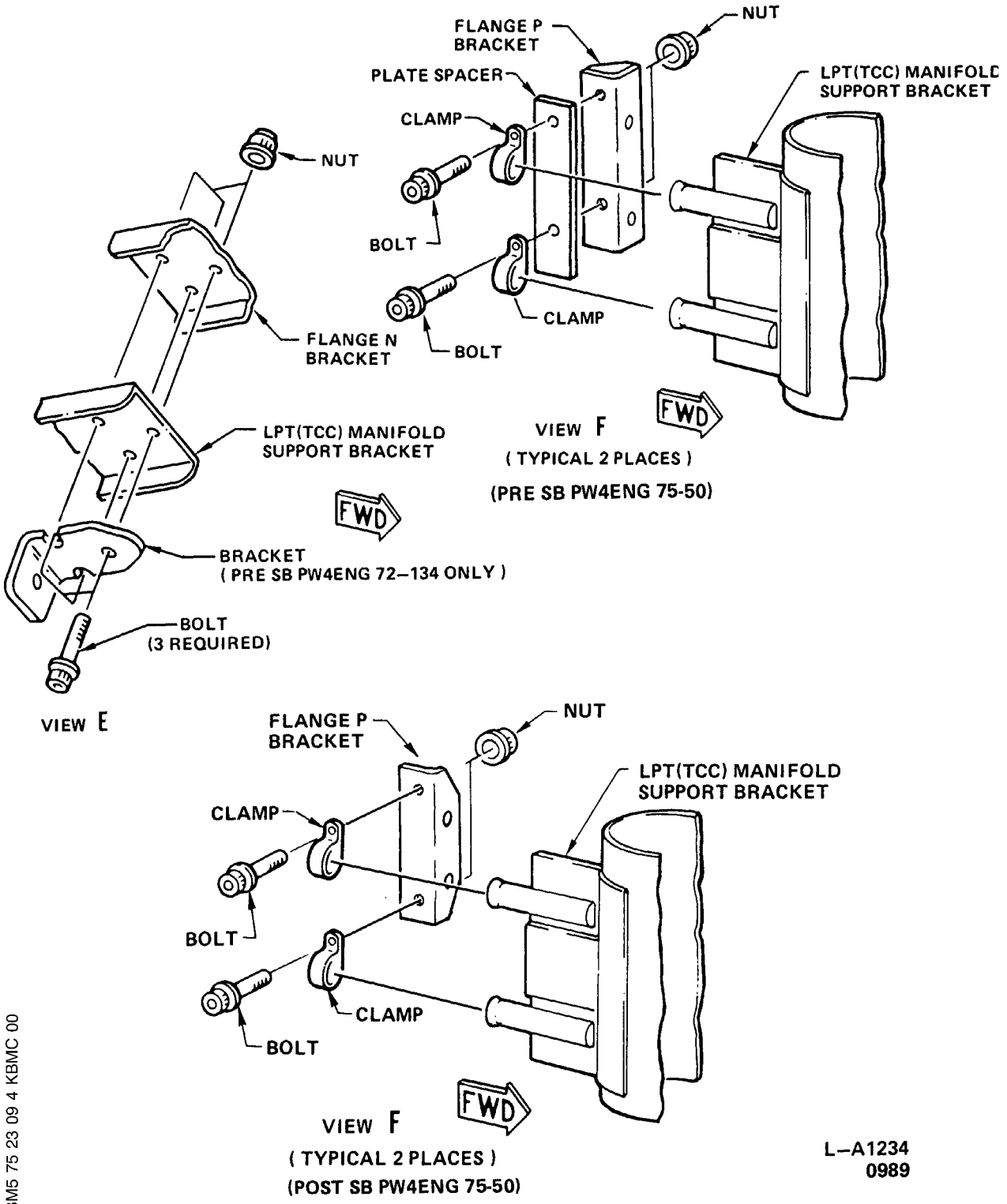


BM5 75 23 09 4 KBMG 00

LPT Turbine Case Cooling (TCC) Plumbing (Right Side)
(Sheet 2/7)
Figure 406

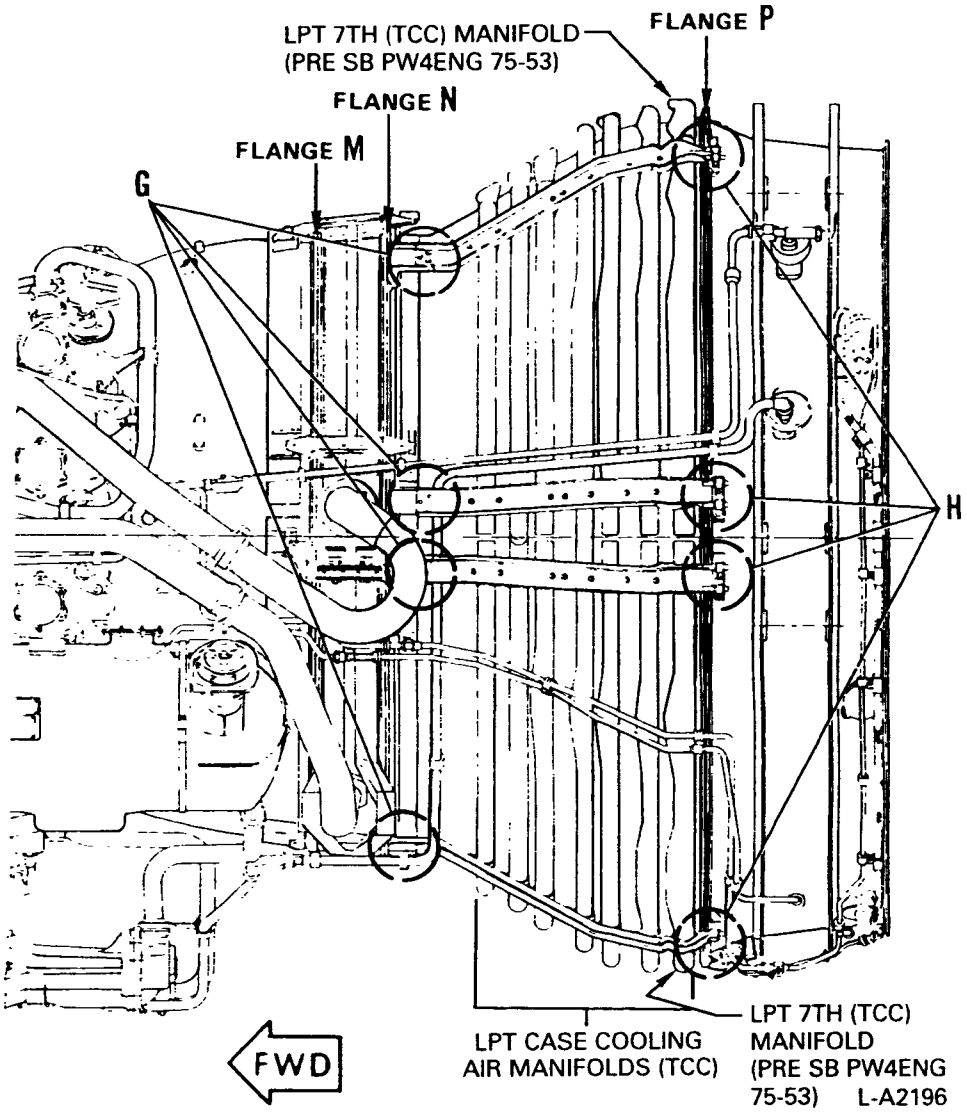


LPT Turbine Case Cooling (TCC) Plumbing (Right Side)
(Sheet 3/7)
Figure 406



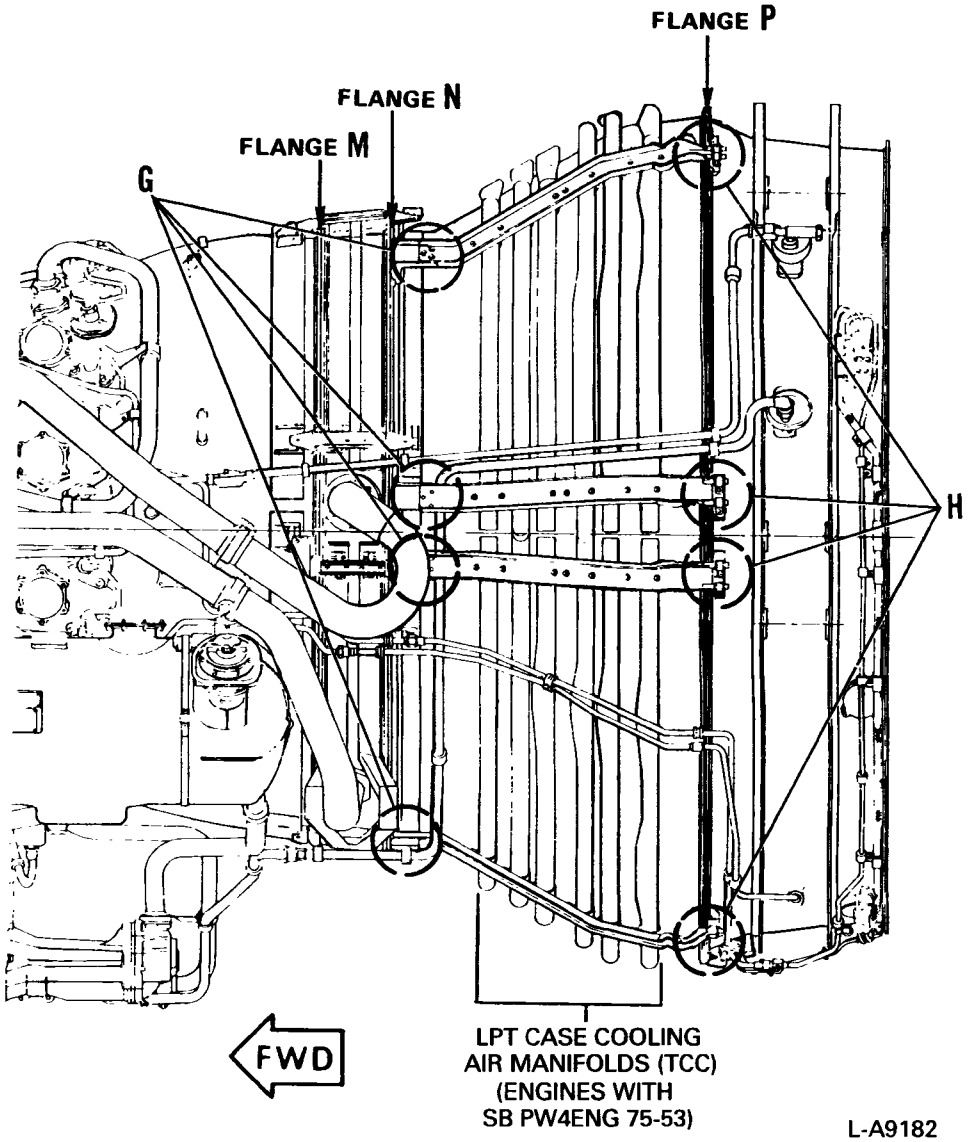
BM5 75 23 09 4 KBMC 00

LPT Turbine Case Cooling (TCC) Plumbing (Right Side)
(Sheet 4/7)
Figure 406



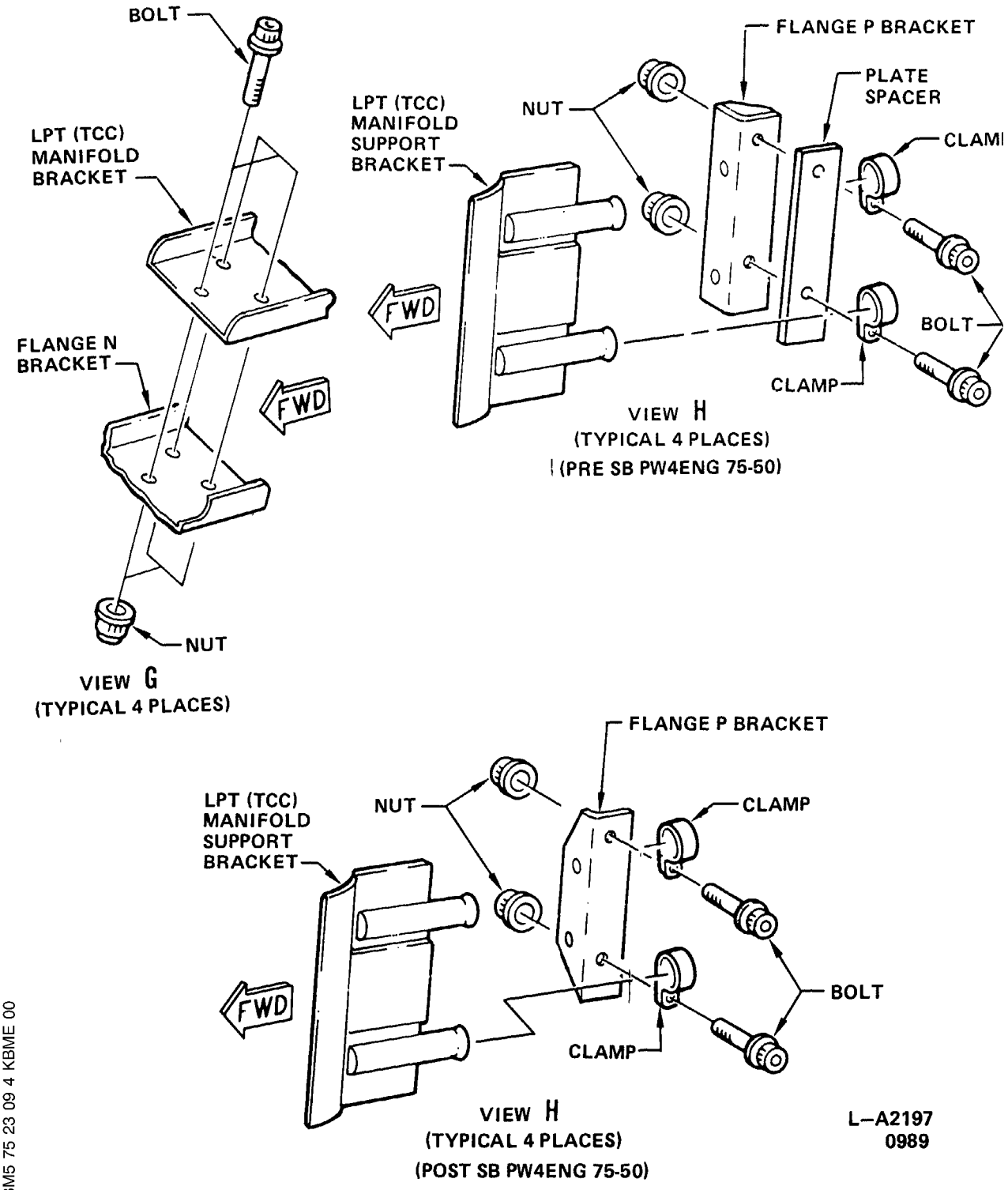
BM5 75 23 09 4 KBMD 00

LPT Turbine Case Cooling (TCC) Plumbing (Right Side)
(Sheet 5/7)
Figure 406



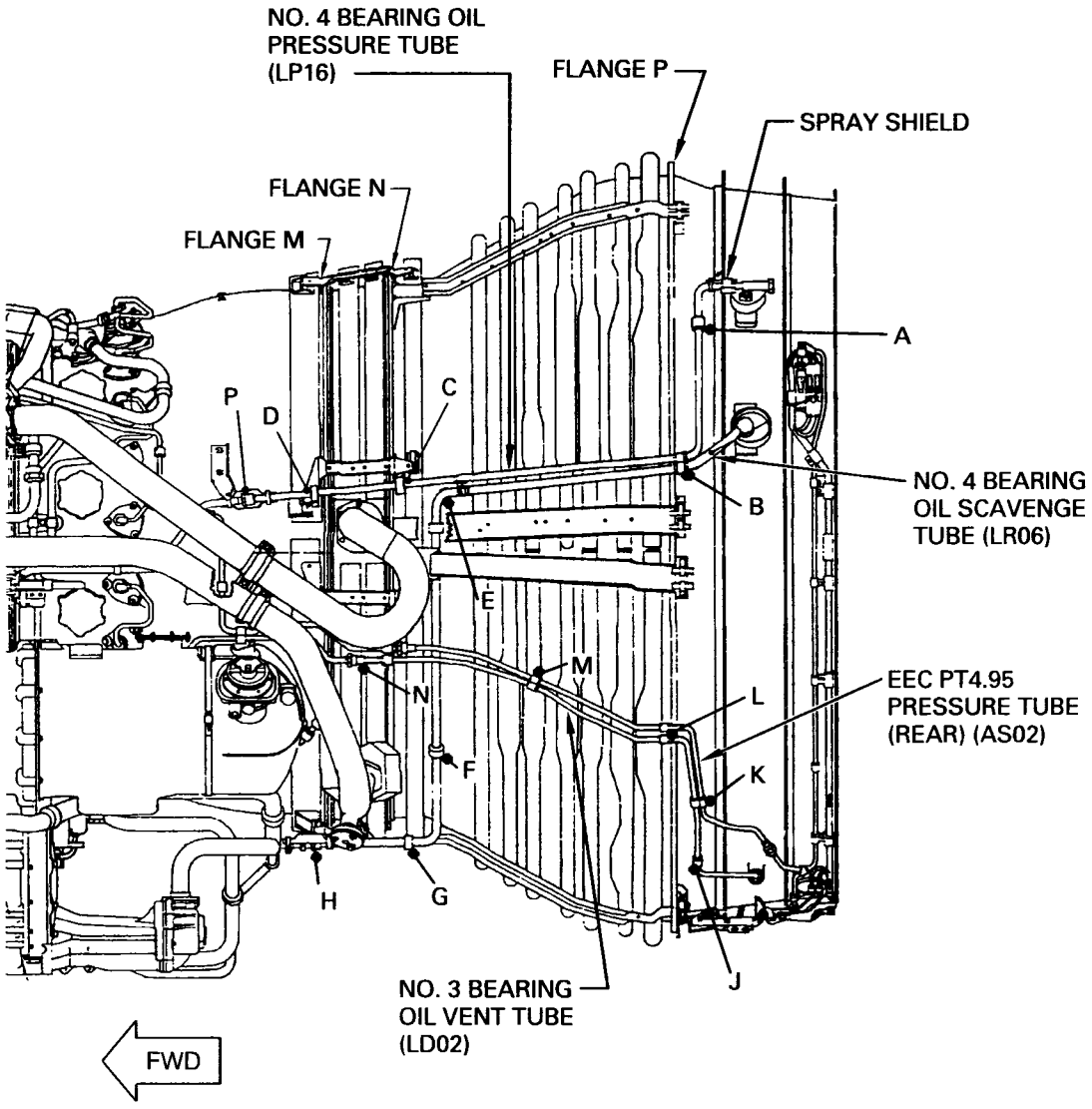
BM5 75 23 09 4 KBMK 00

LPT Turbine Case Cooling (TCC) Plumbing (Right Side)
(Sheet 6/7)
Figure 406



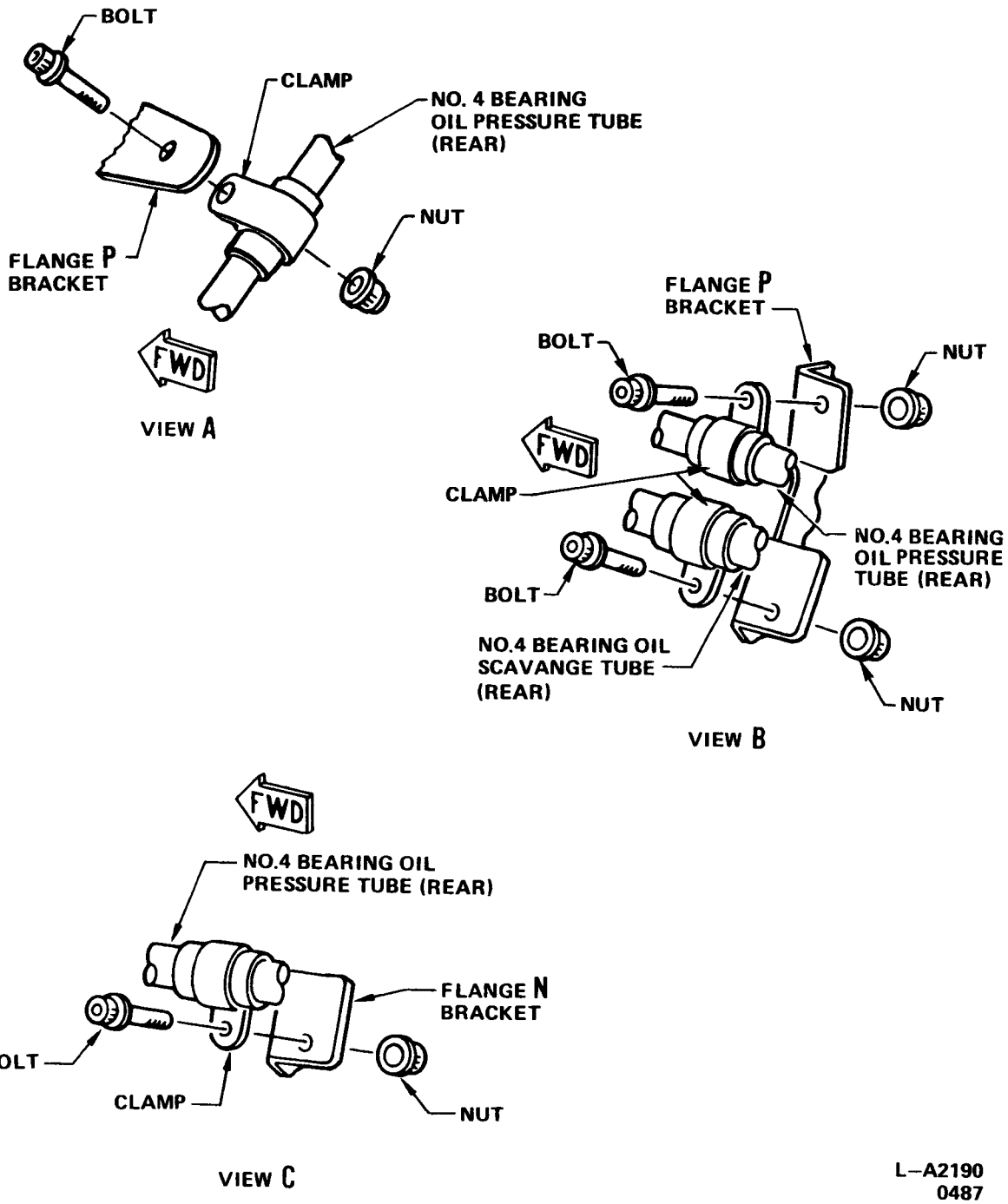
BM5 75 23 09 4 KBME 00

LPT Turbine Case Cooling (TCC) Plumbing (Right Side)
(Sheet 7/7)
Figure 406



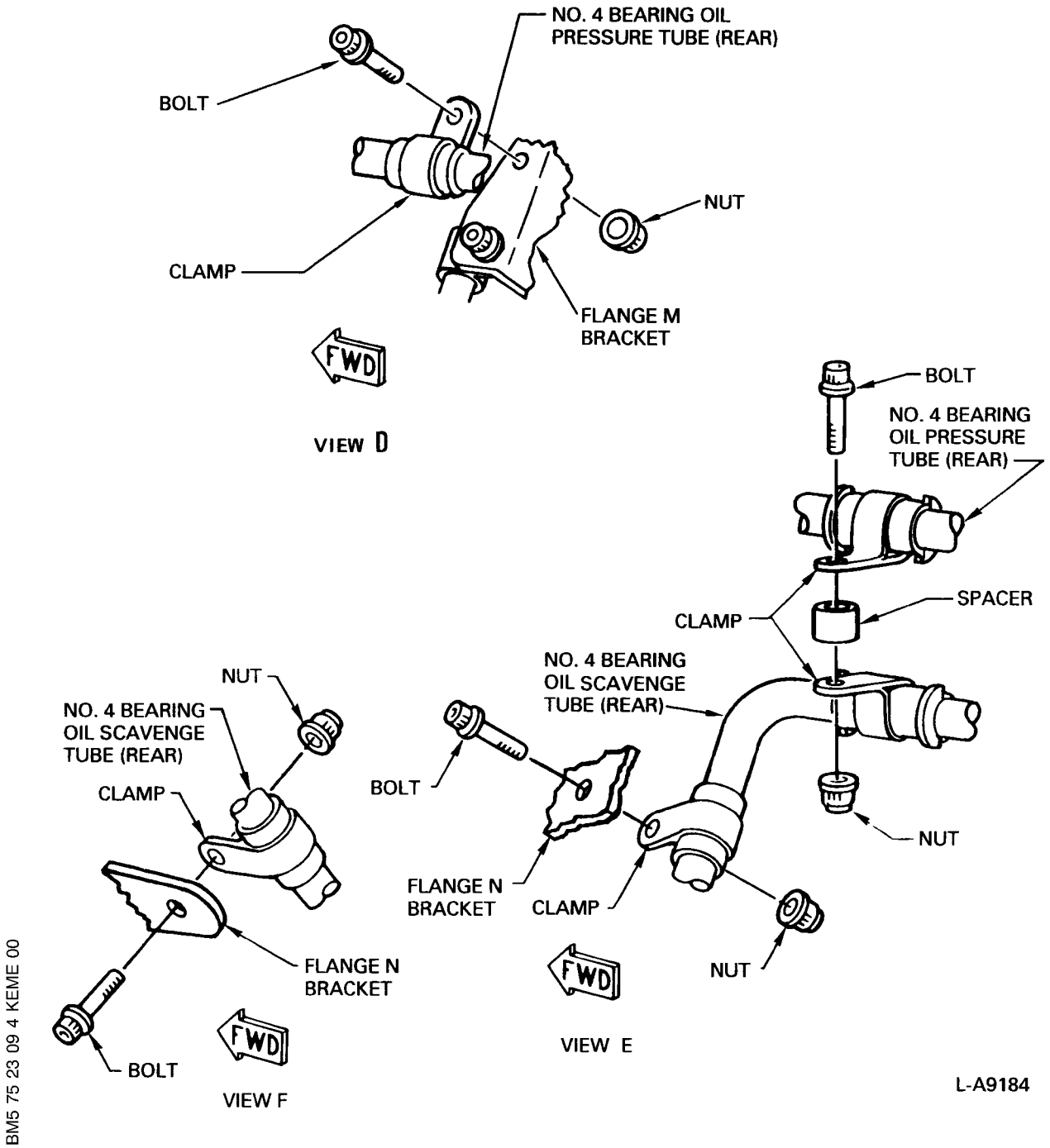
BM5 75 23 09 4 KEMA 00

External Tubes (TCC) Access
(Sheet 1/8)
Figure 407

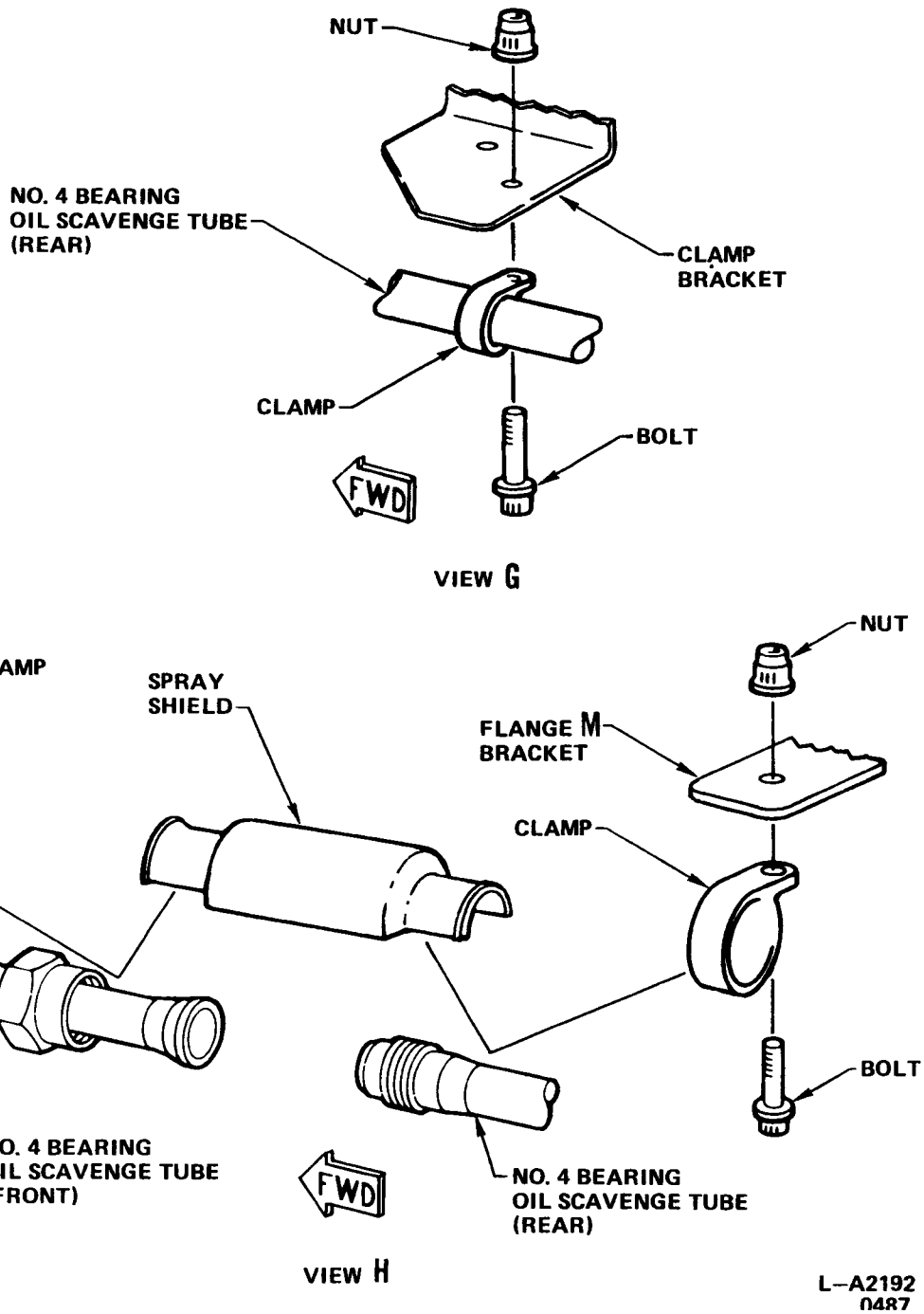


BM5 75 23 09 4 KEMC 00

External Tubes (TCC) Access
(Sheet 2/8)
Figure 407

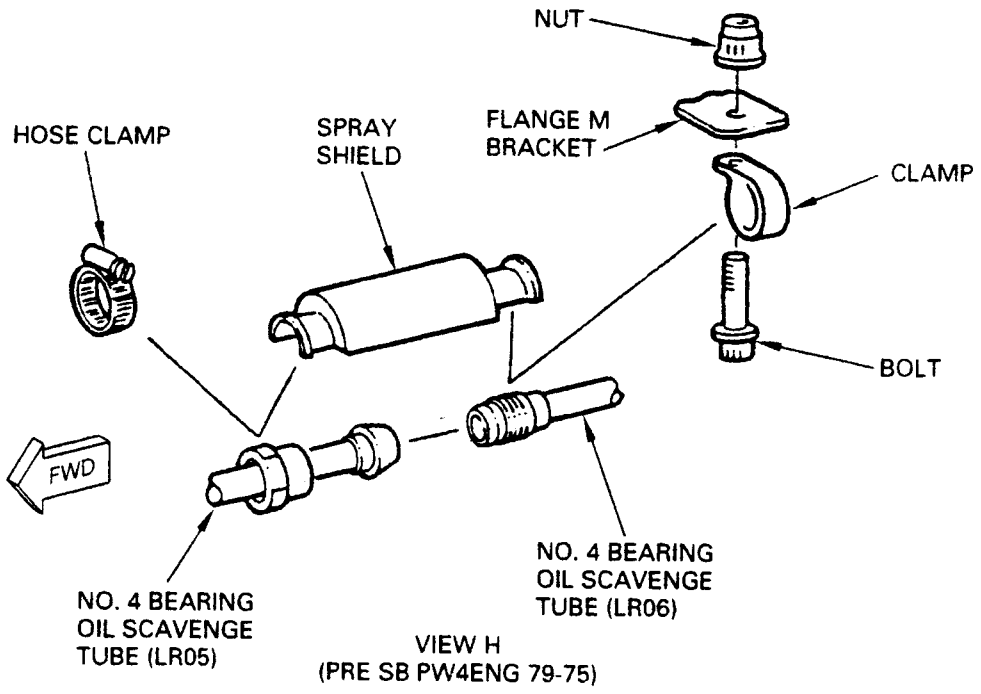


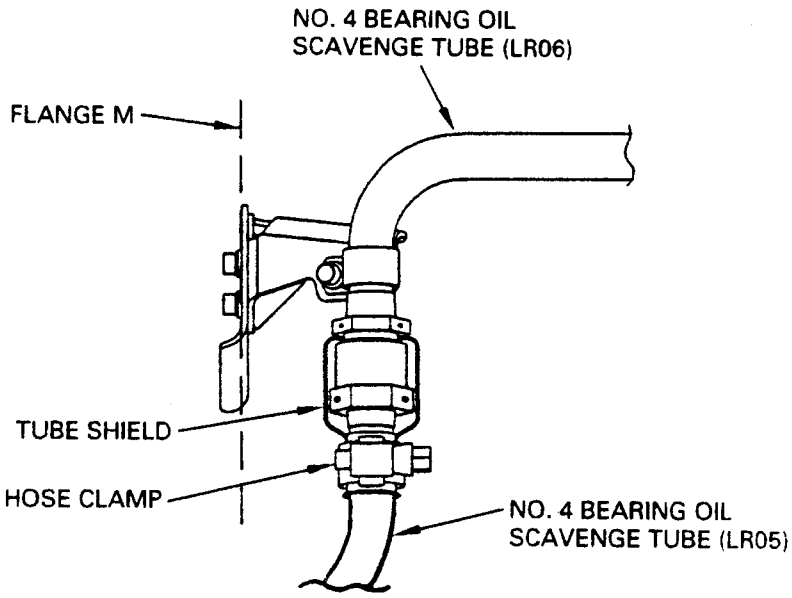
External Tube (TCC) Access
(Sheet 3/8)
Figure 407



BM5 75 23 09 4 KEMG 00

External Tube (TCC) Access
(Sheet 4/8)
Figure 407





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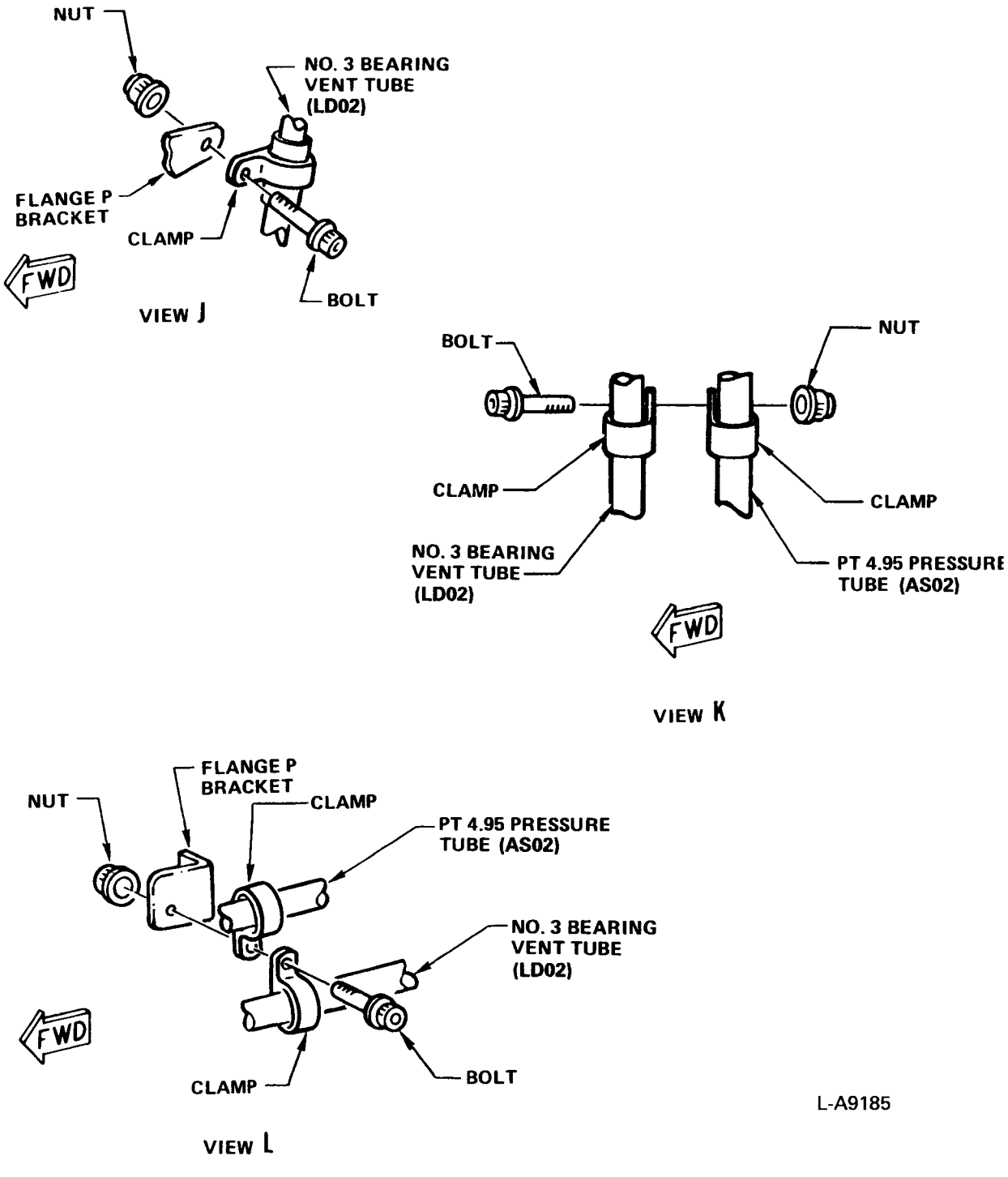
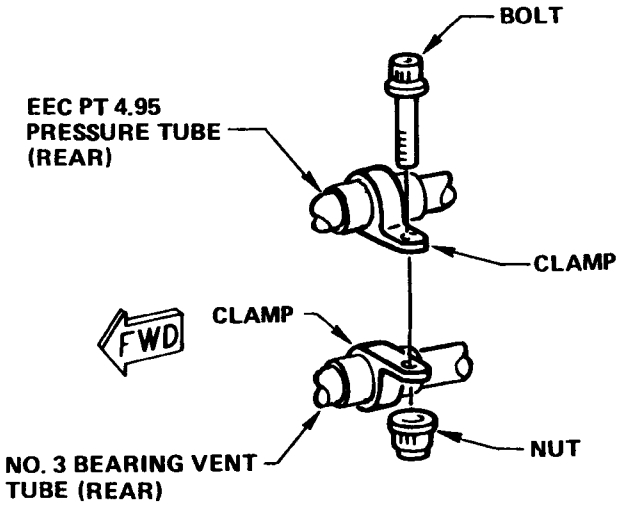
BM5 75 23 09 4 KEMM 00

External Tubes (TCC) Access
(Sheet 5/8)
Figure 407



BM5 75 23 09 4 KEMJ 00

External Tubes (TCC) Access
(Sheet 6/8)
Figure 407



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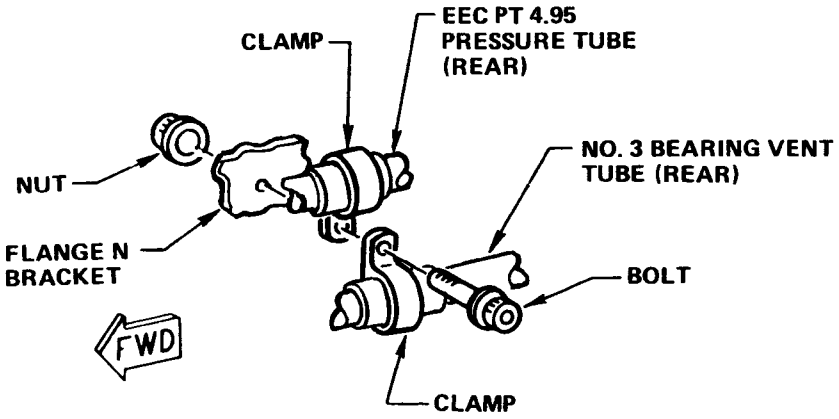

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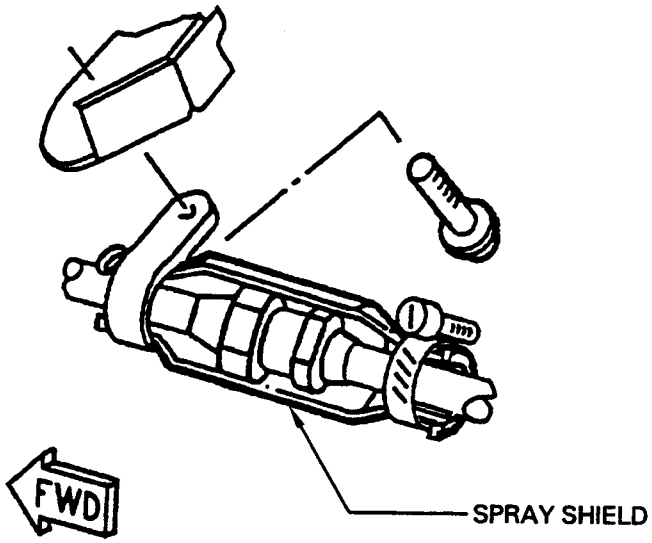
0487

BM5 75 23 09 4 KEML 00

External Tubes (TCC) Access
(Sheet 7/8)
Figure 407



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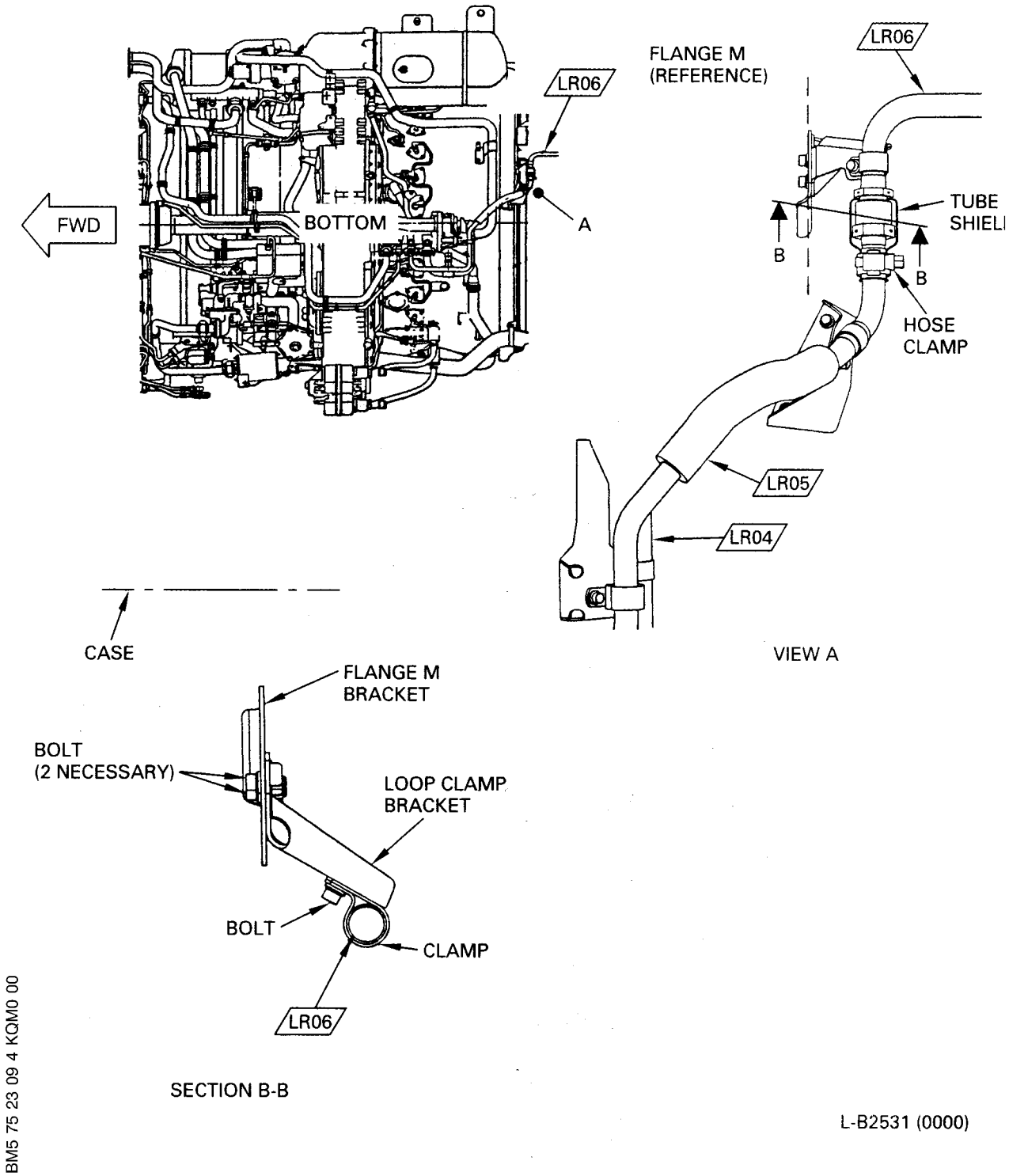
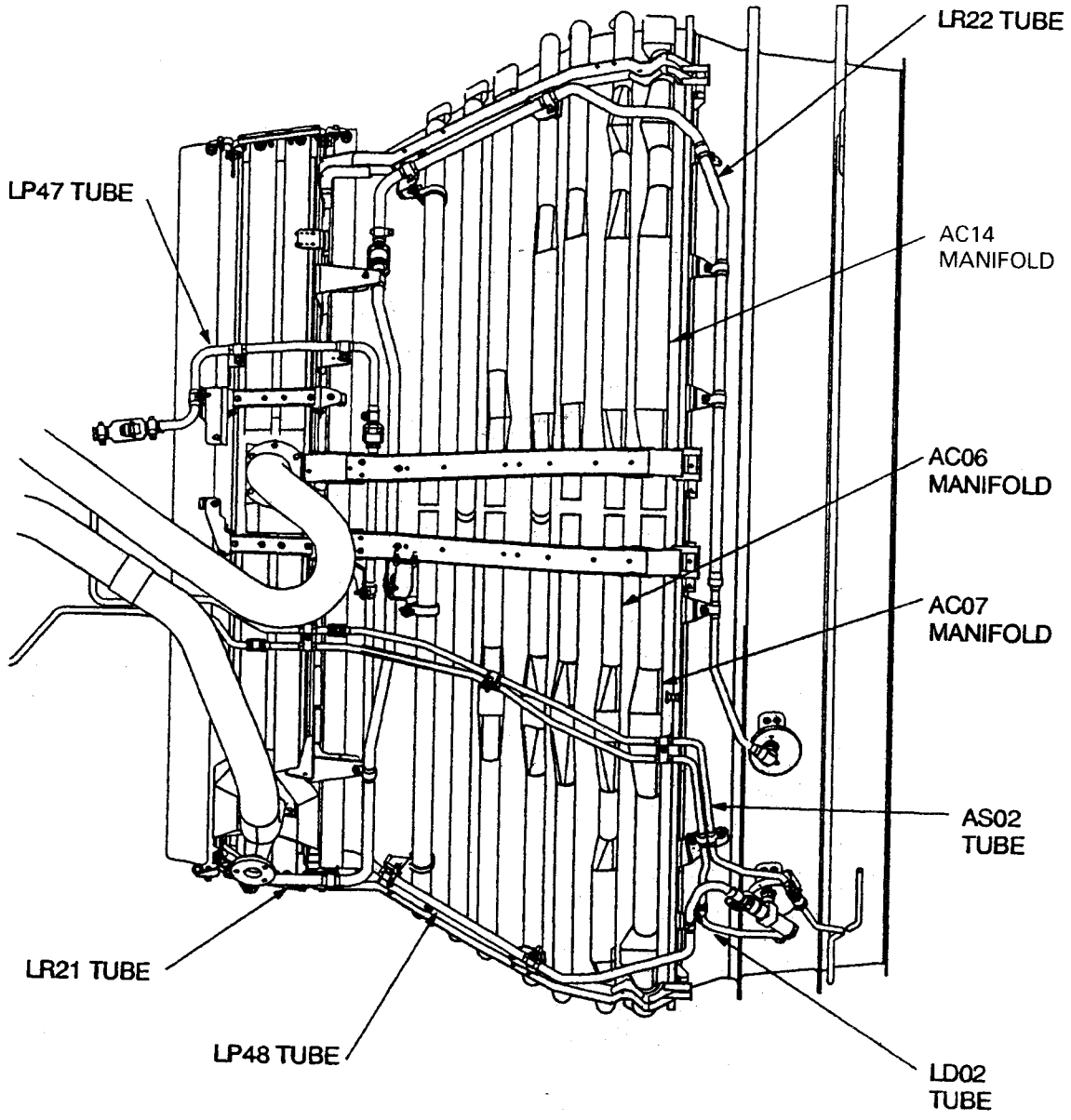
External Tubes (TCC) Access
(Sheet 8/8)
Figure 407

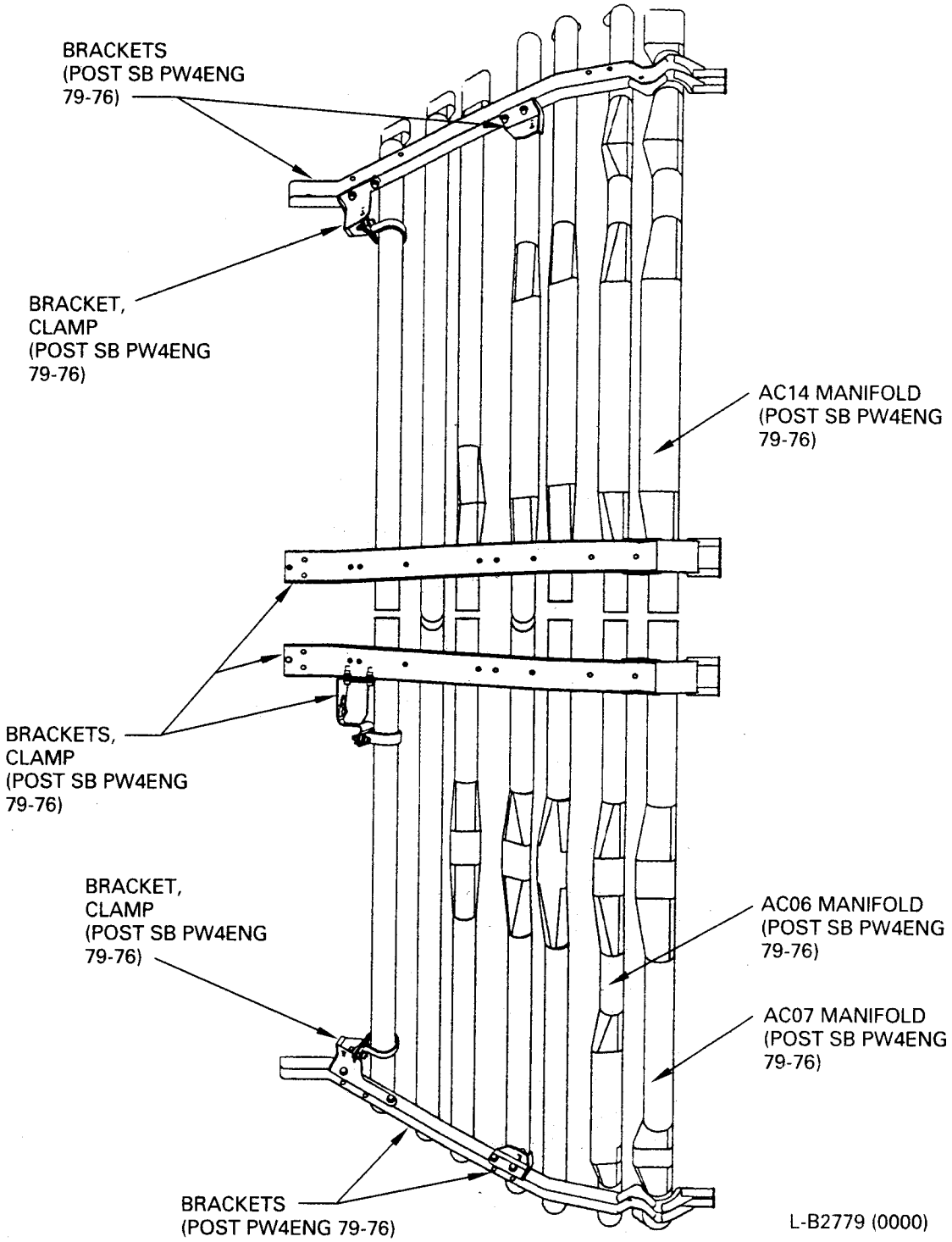


External Tubes Clipping Views
(Post SB PW4ENG 79-75)
Figure 408



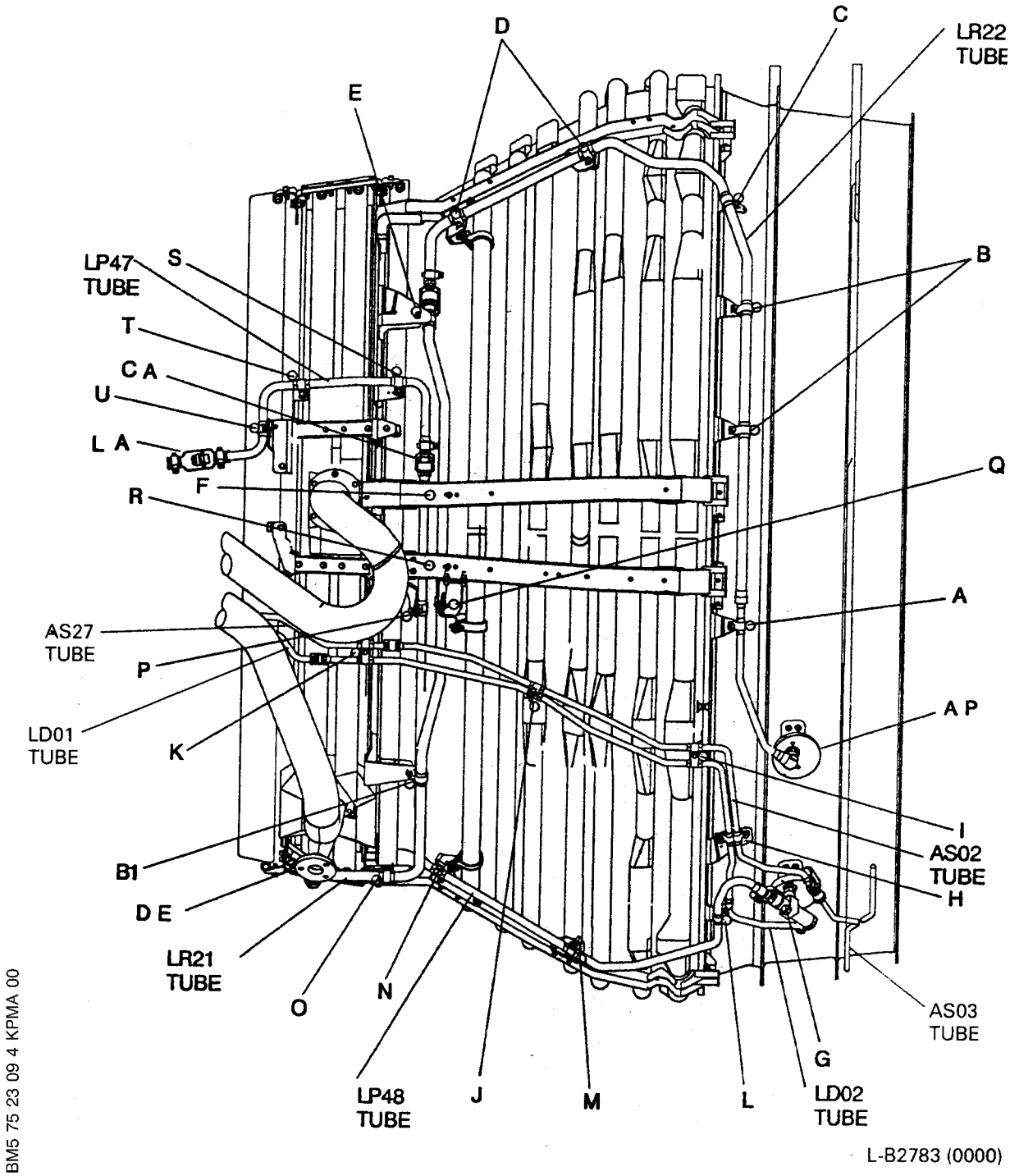
BM5 75 23 09 4 KMMA 00

LPT Turbine Case Cooling - Manifolds Clipping
(Post SB PW4ENG 79-76) (Sheet 1/2)
Figure 409



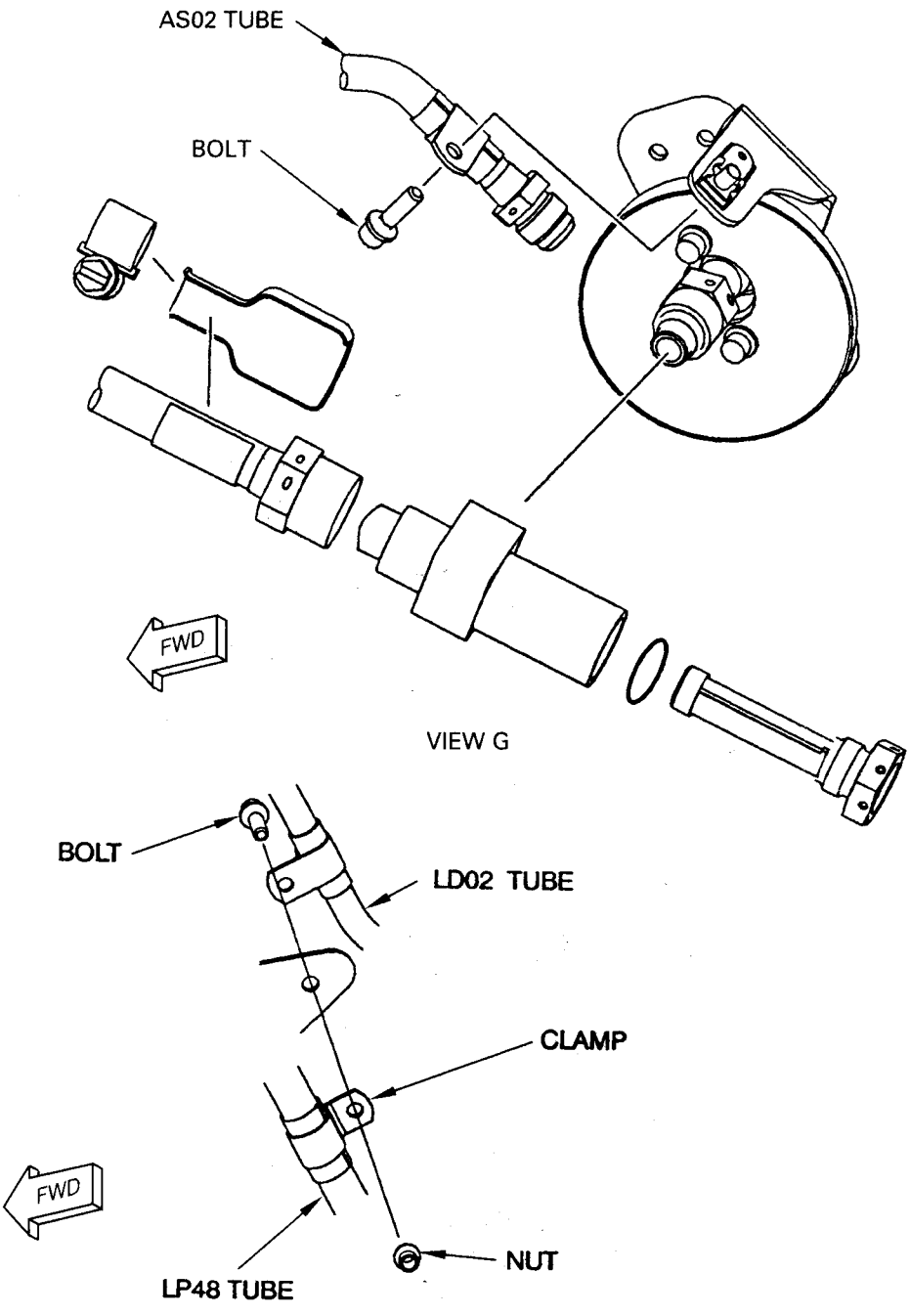
BM5 75 23 09 4 KMMJ 00

LPT Turbine Case Cooling - Manifolds Clipping
(Post SB PW4ENG 79-76) (Sheet 2/2)
Figure 409



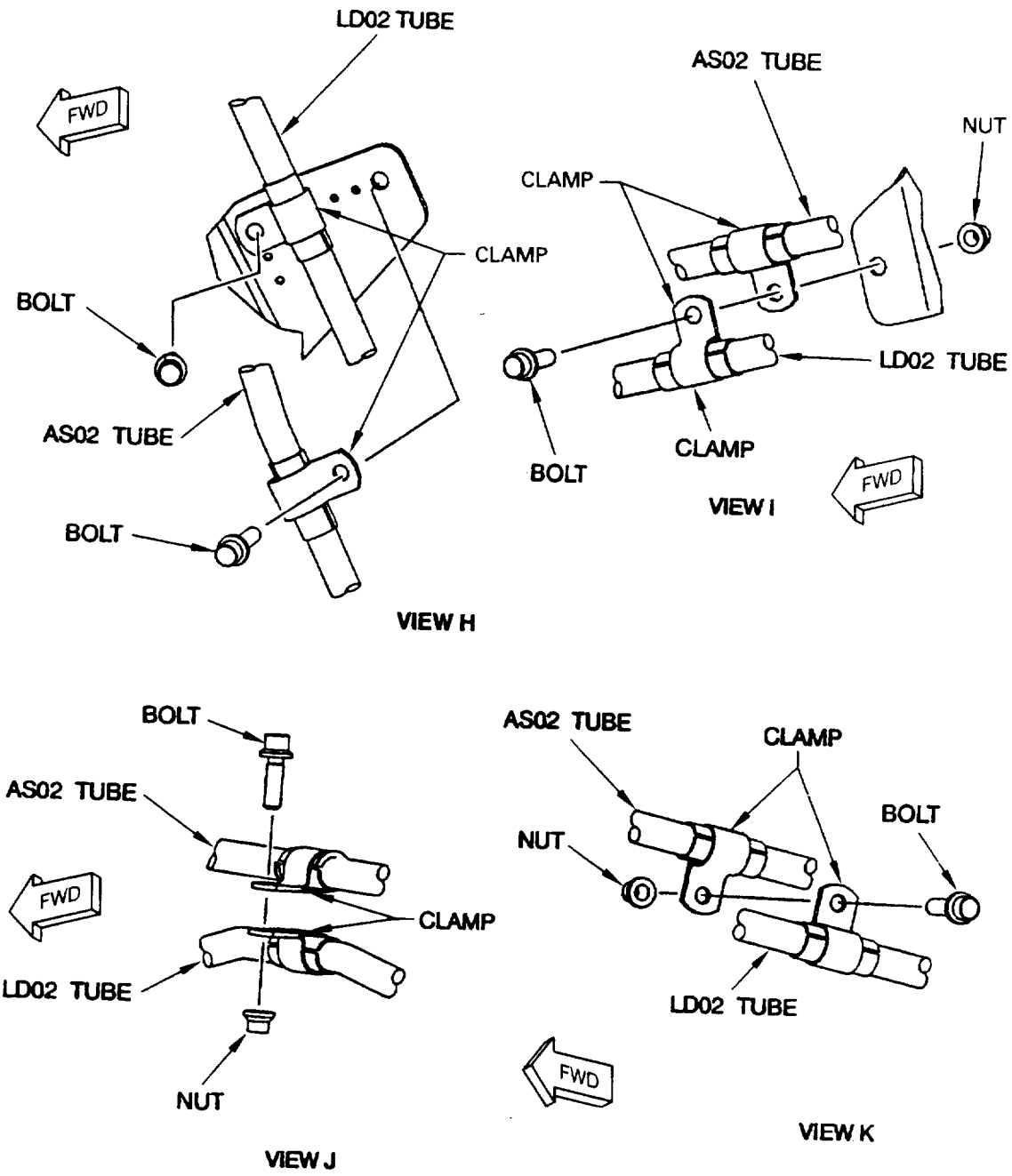
BM5 75 23 09 4 KPMA 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 1/12)
Figure 410



BM5 75 23 09 4 KPMB 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 2/12)
Figure 410



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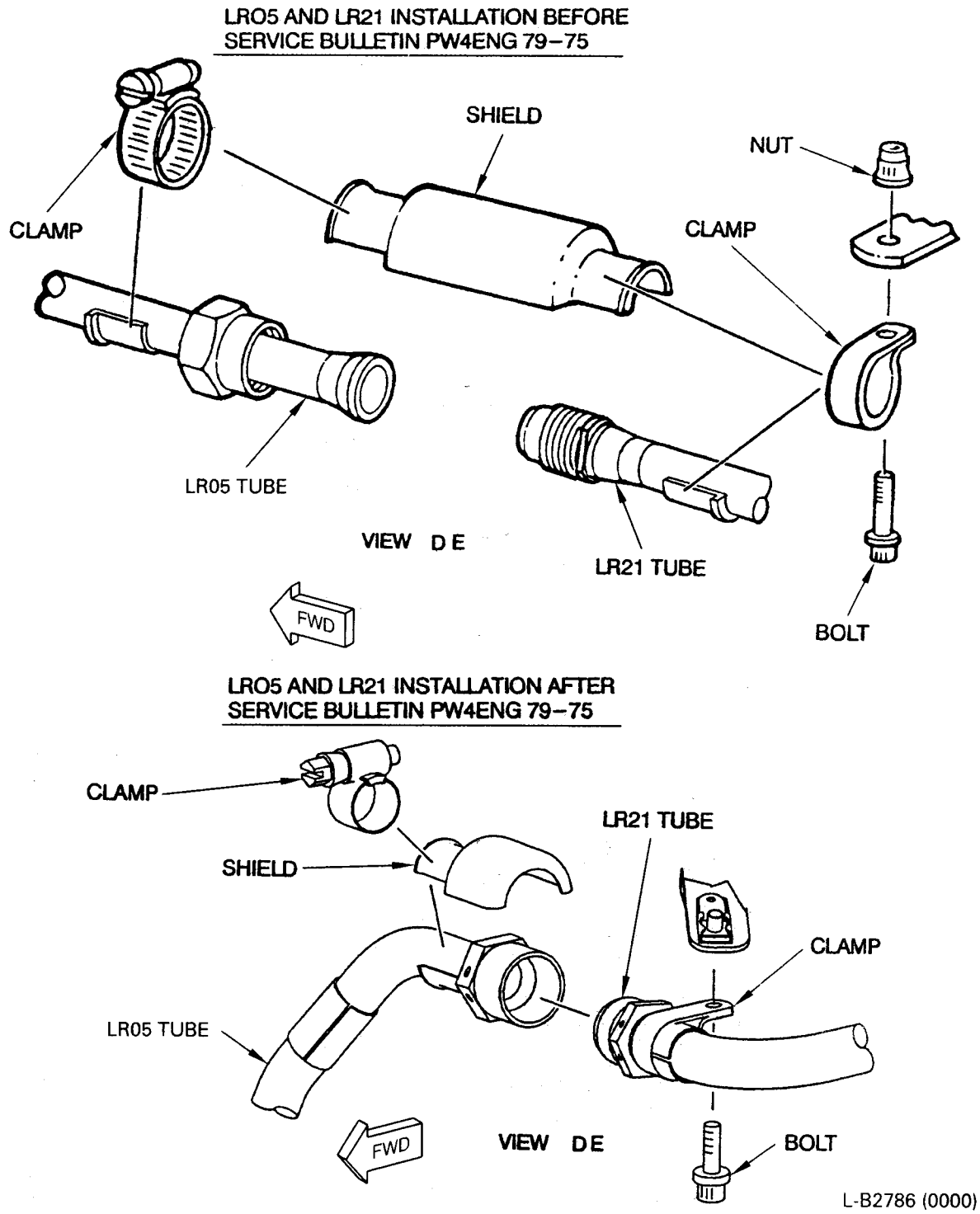
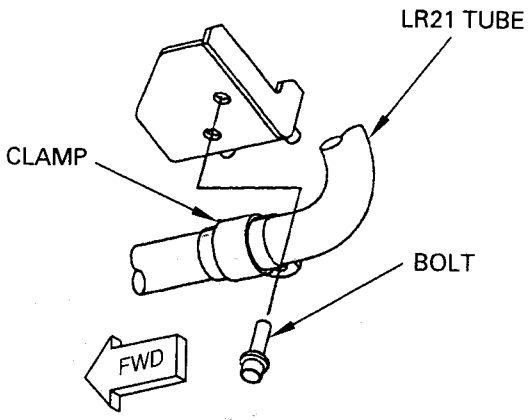
BM5 75 23 09 4 KPMC 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 3/12)
Figure 410



BM5 75 23 09 4 KPMD 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 4/12)
Figure 410



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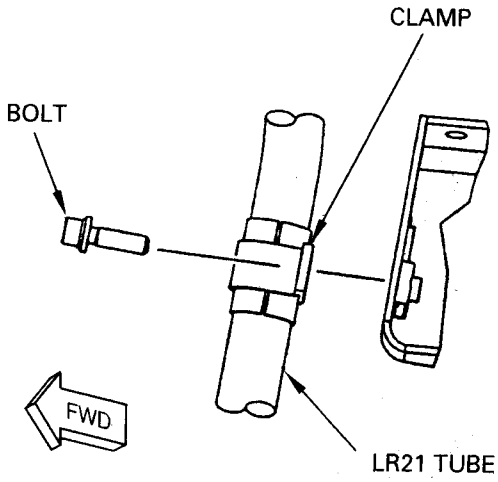

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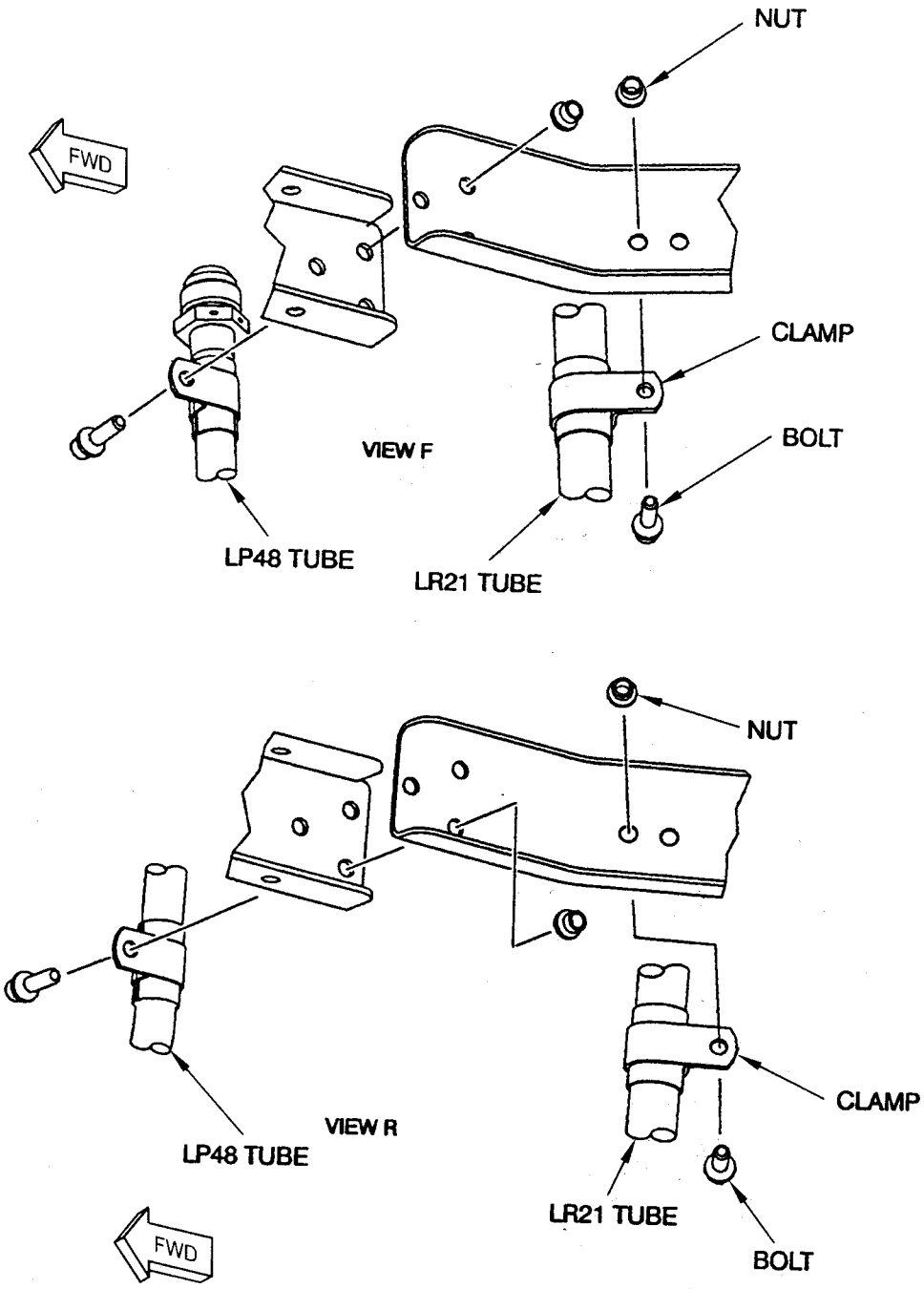
External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 5/12)
Figure 410



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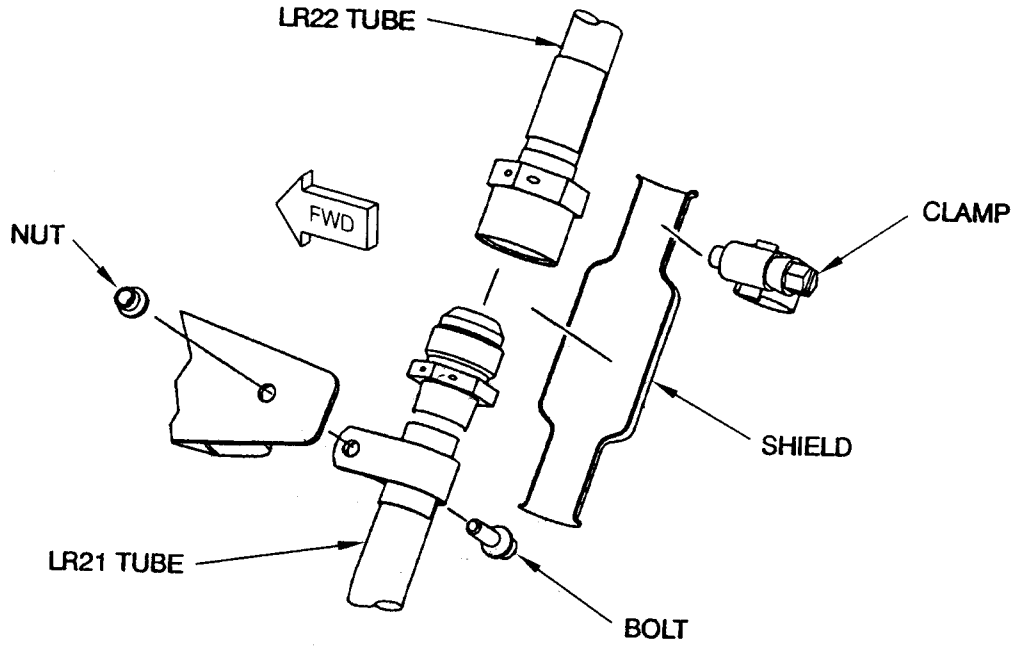
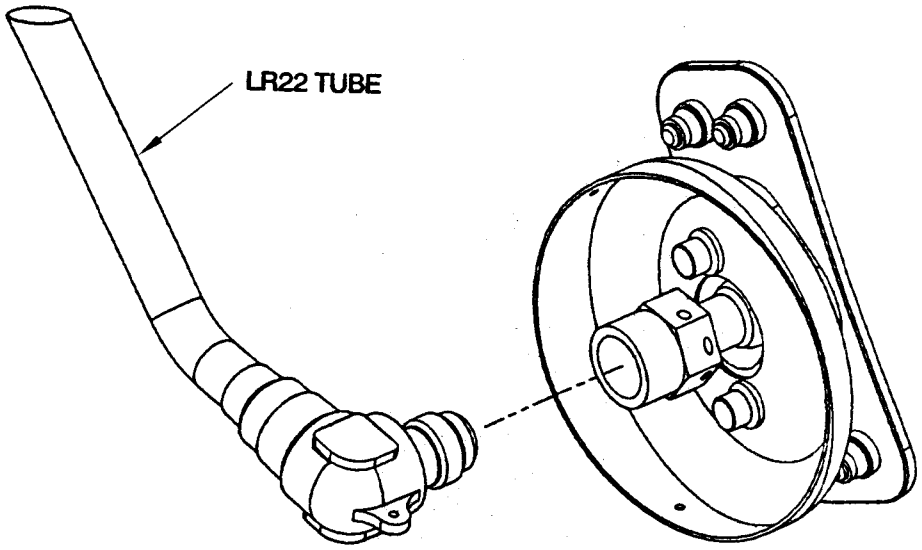
BM5 75 23 09 4 KPMF 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 6/12)
Figure 410



VIEW E



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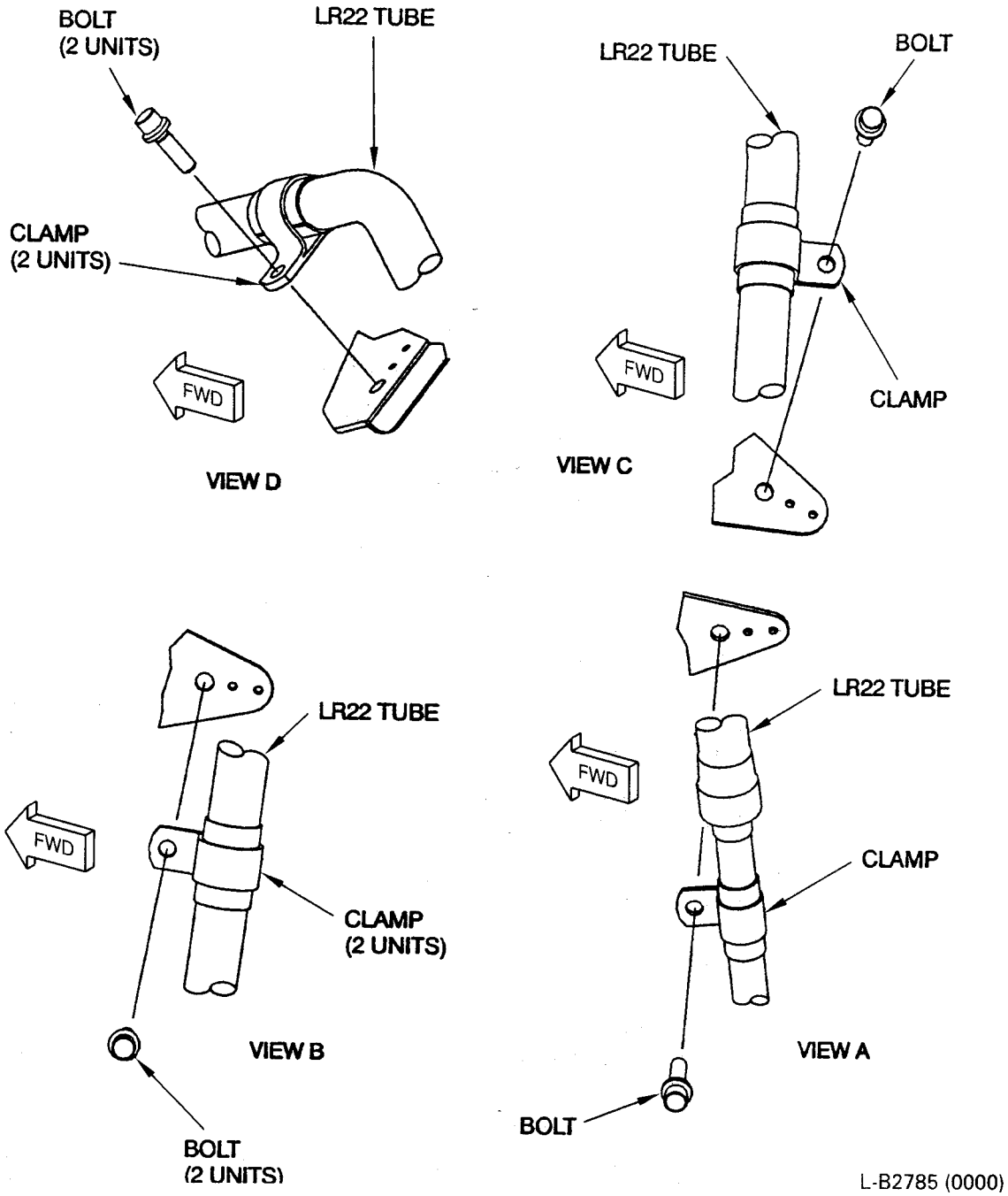
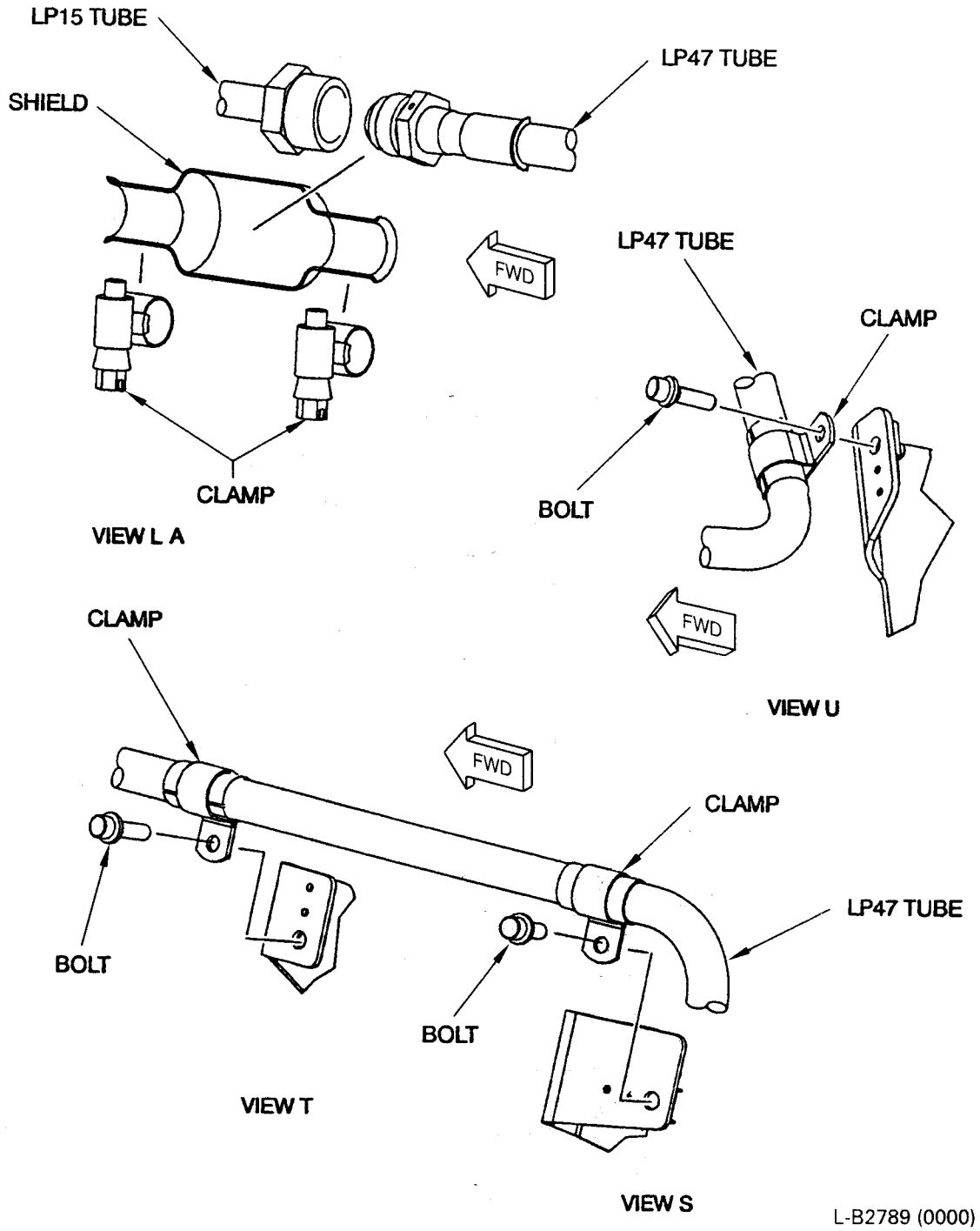
BM5 75 23 09 4 KPMG 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 7/12)
Figure 410



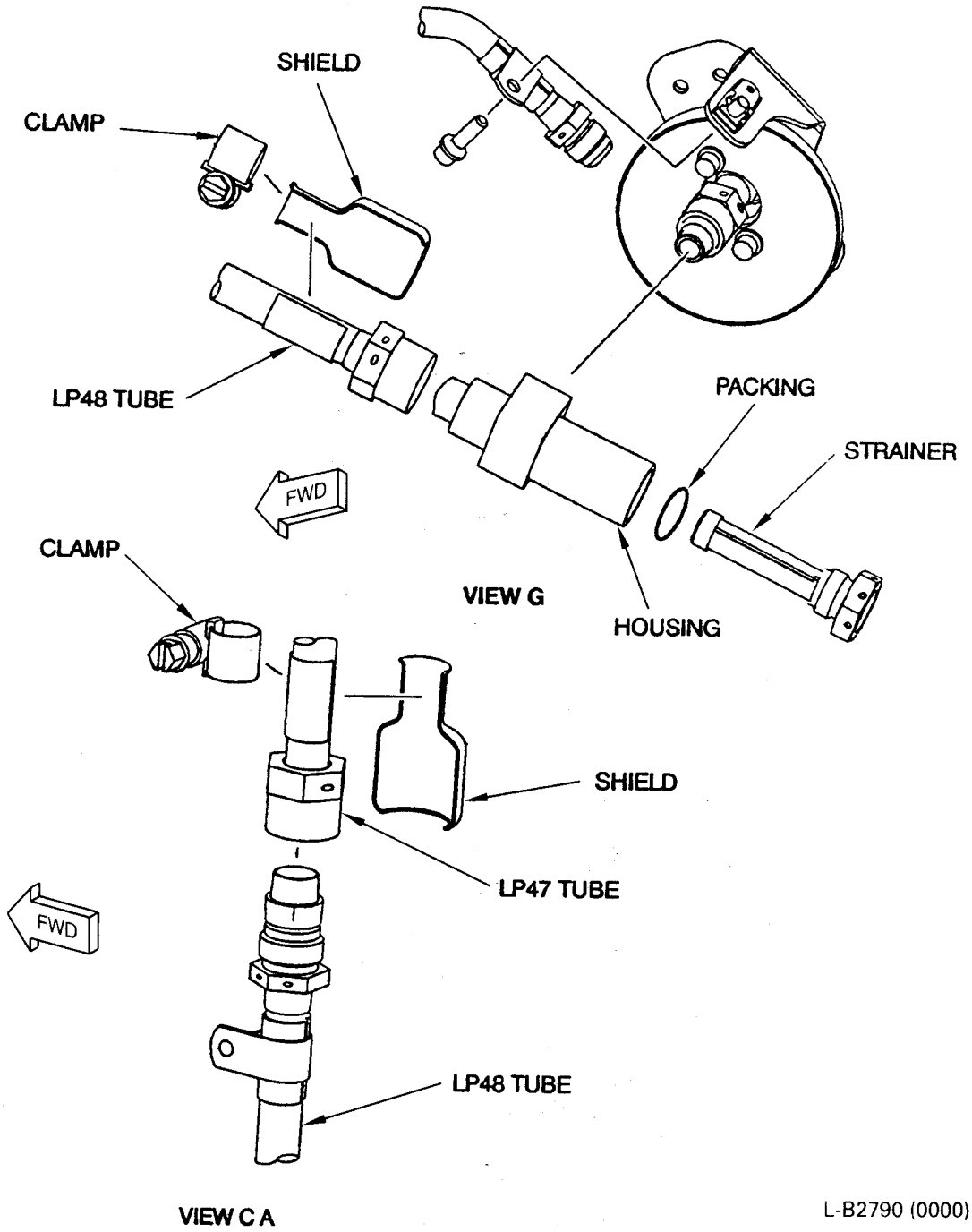
BM5 75 23 09 4 KPMJ 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 8/12)
Figure 410



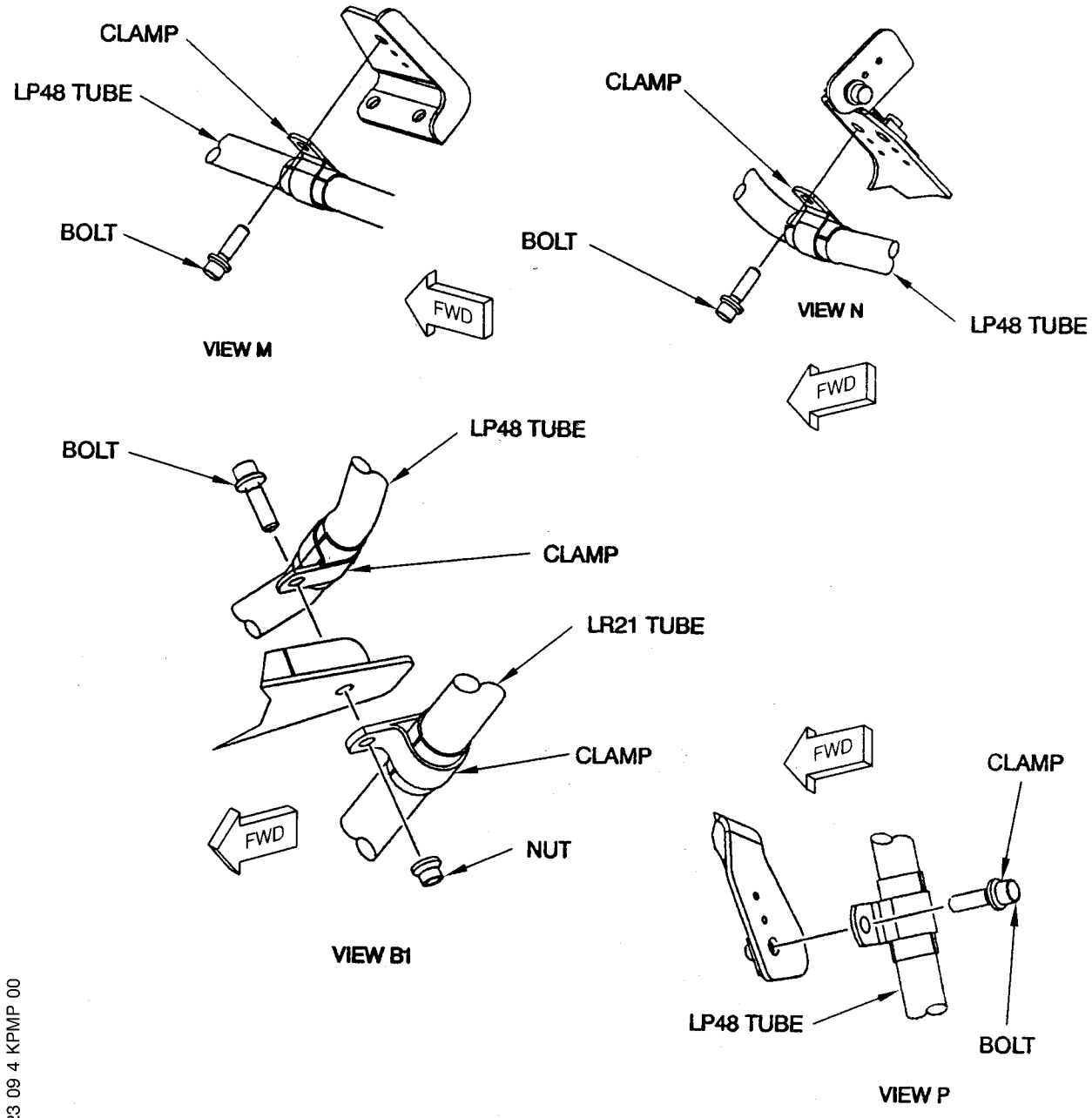
BM5 75 23 09 4 KPMK 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 9/12)
Figure 410



BM5 75 23 09 4 KPML 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 10/12)
Figure 410



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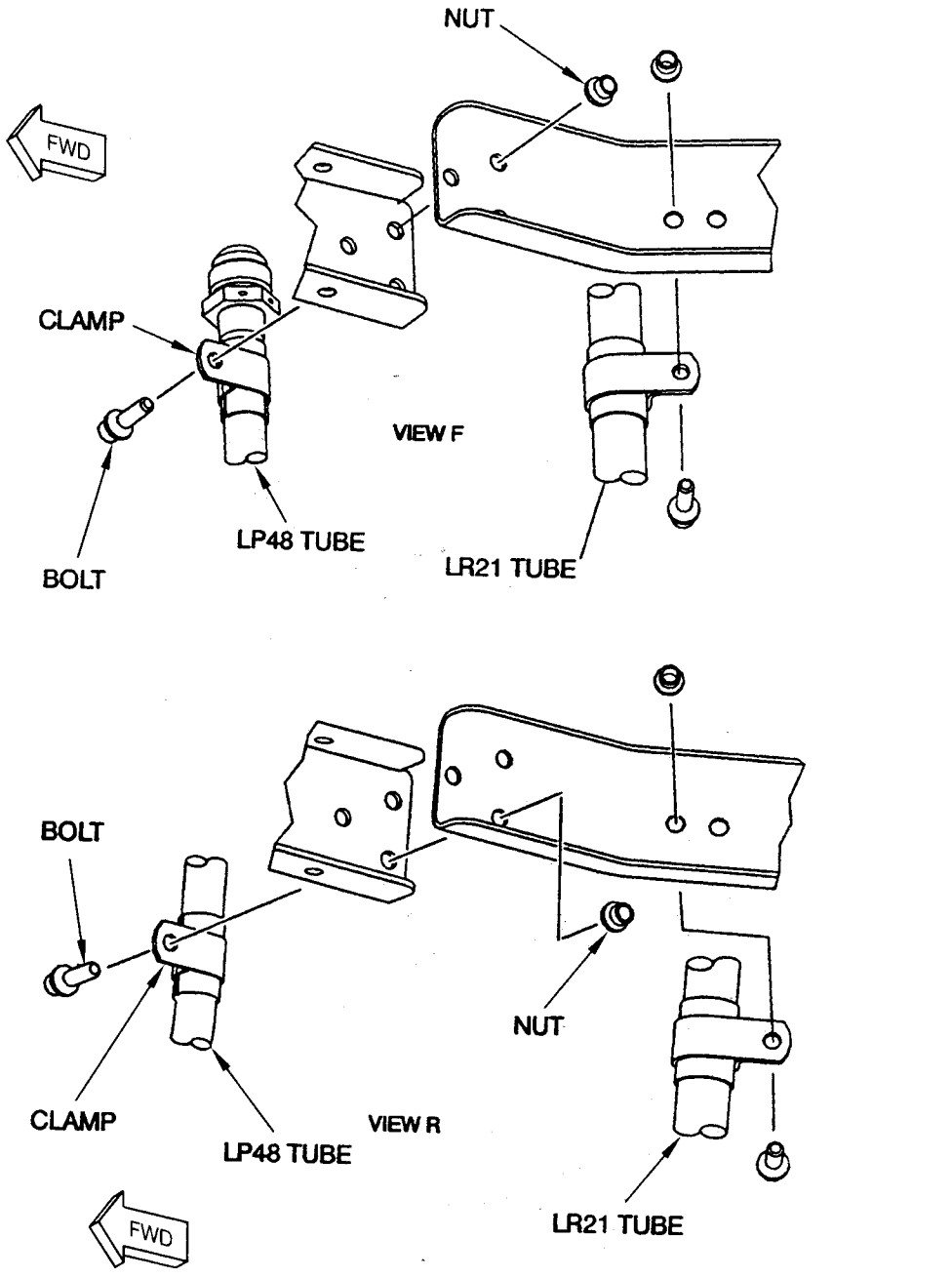
L-B2791 (0000)

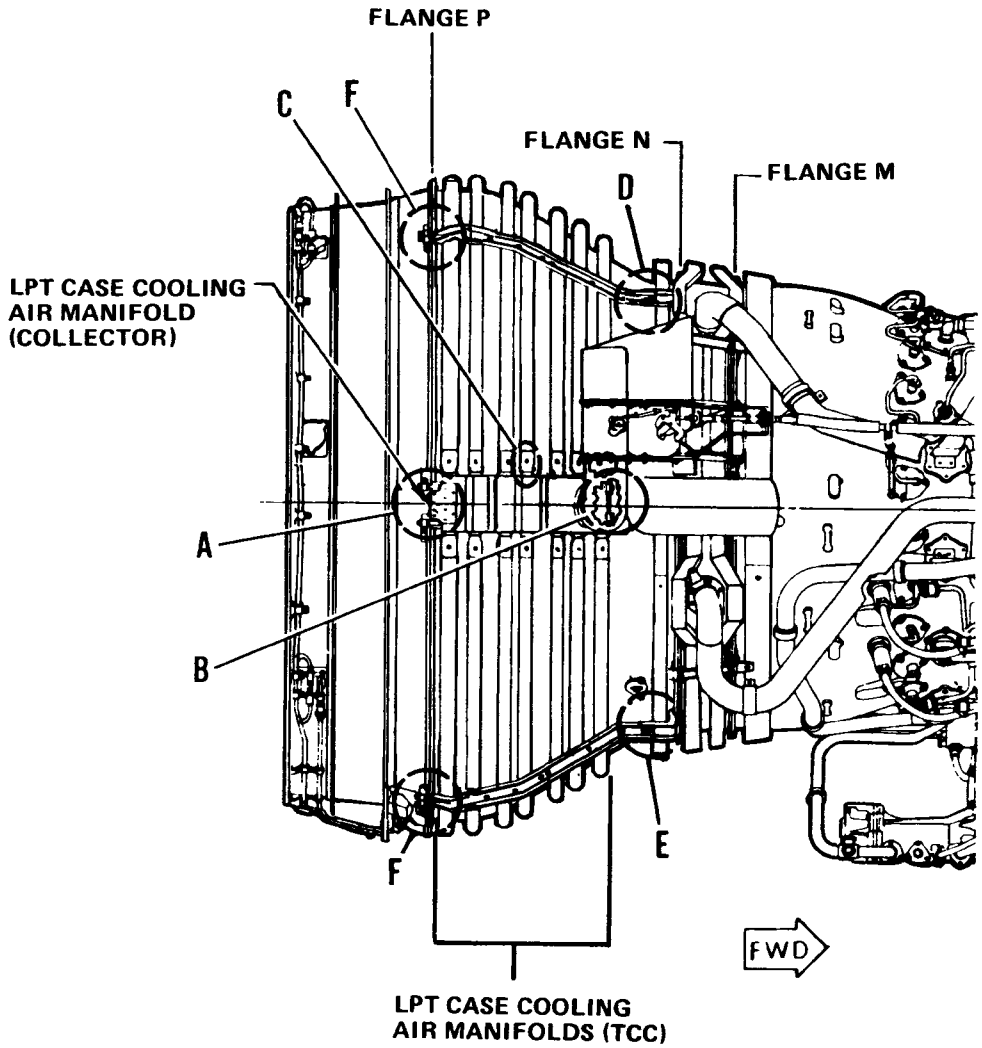
External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 11/12)
Figure 410



L-B2792 (0000)

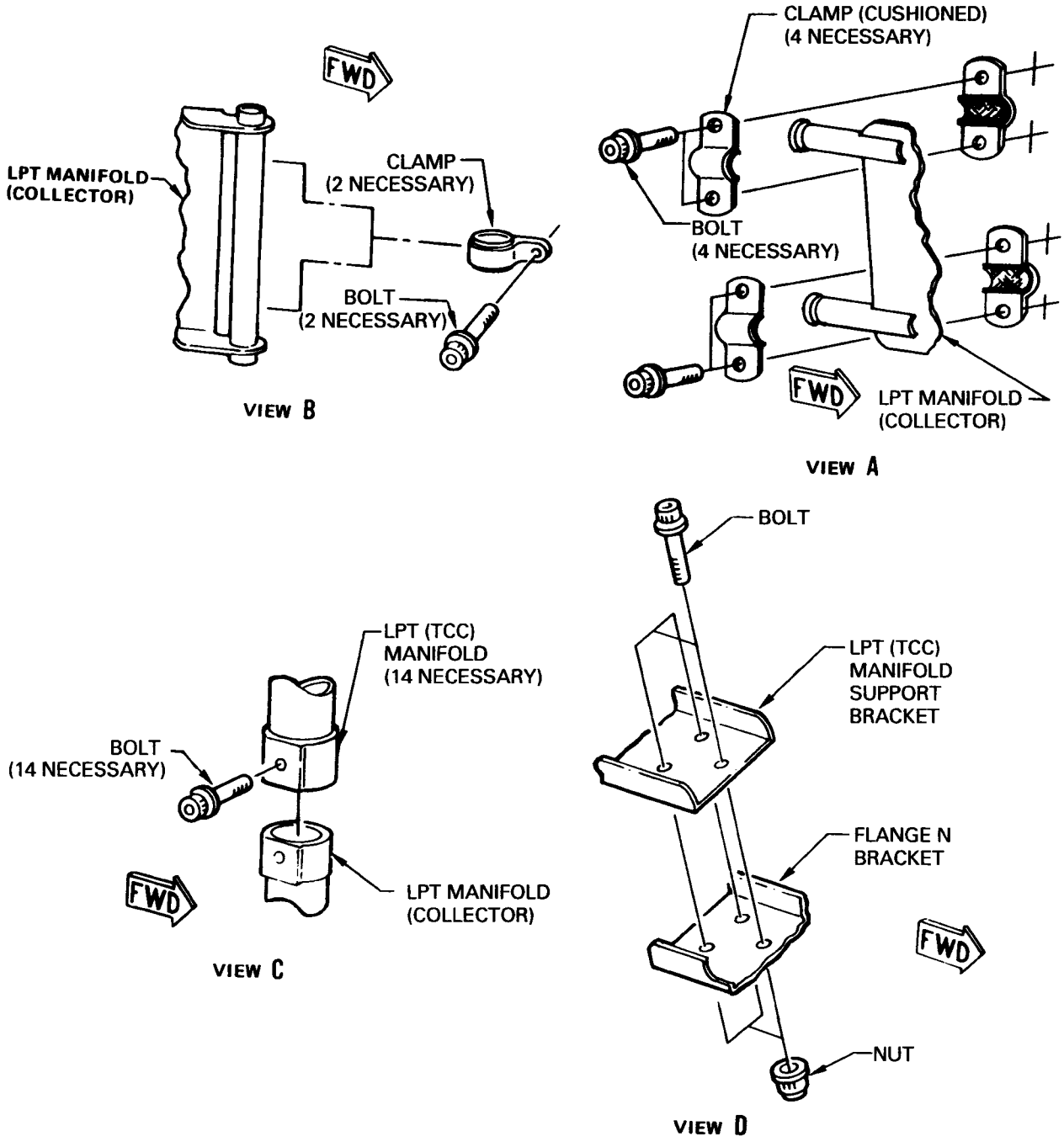
BM5 75 23 09 4 KPMQ 00

External Plumbing Clipping Views
(Post SB PW4ENG 79-76) (Sheet 12/12)
Figure 410



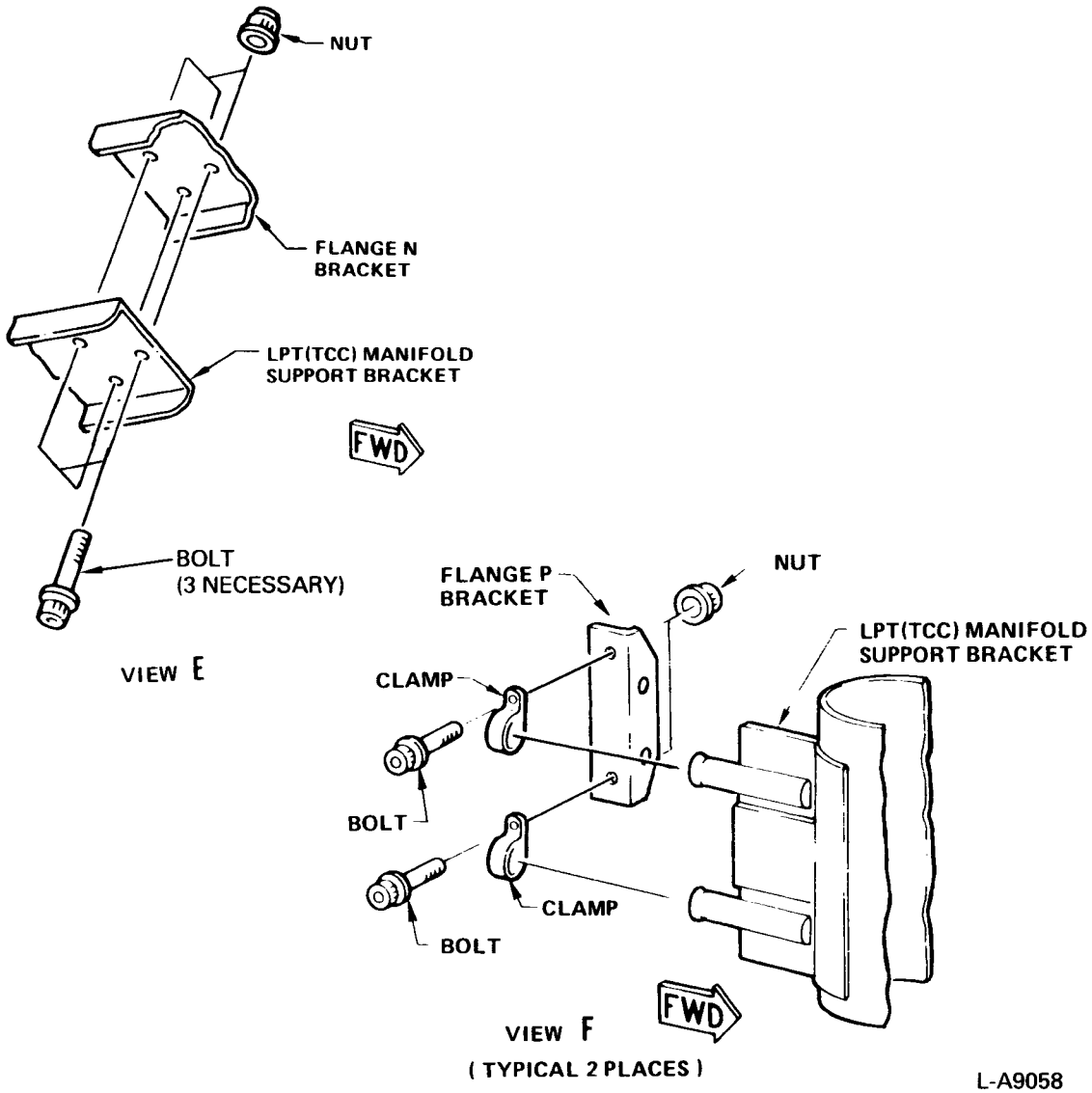
BM5 75 23 09 4 KGMA 00

LPT Turbine Case Cooling (TCC) (Manifolds Right Side)
(Sheet 1/5)
Figure 411



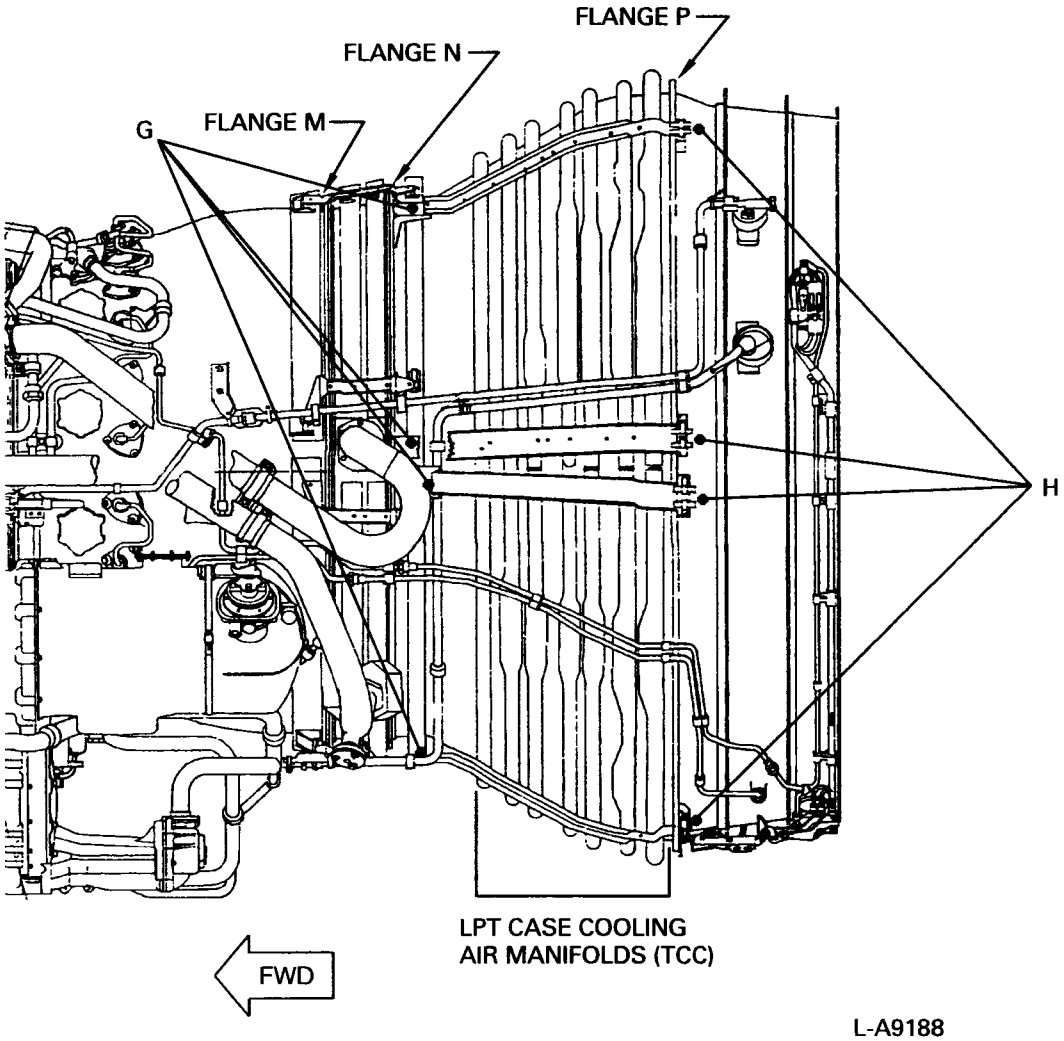
BM5 75 23 09 4 KGMC 00

LPT Turbine Case Cooling (TCC) (Manifolds Right Side)
for PHASE III Engine Configuration (Sheet 2/5)
Figure 411



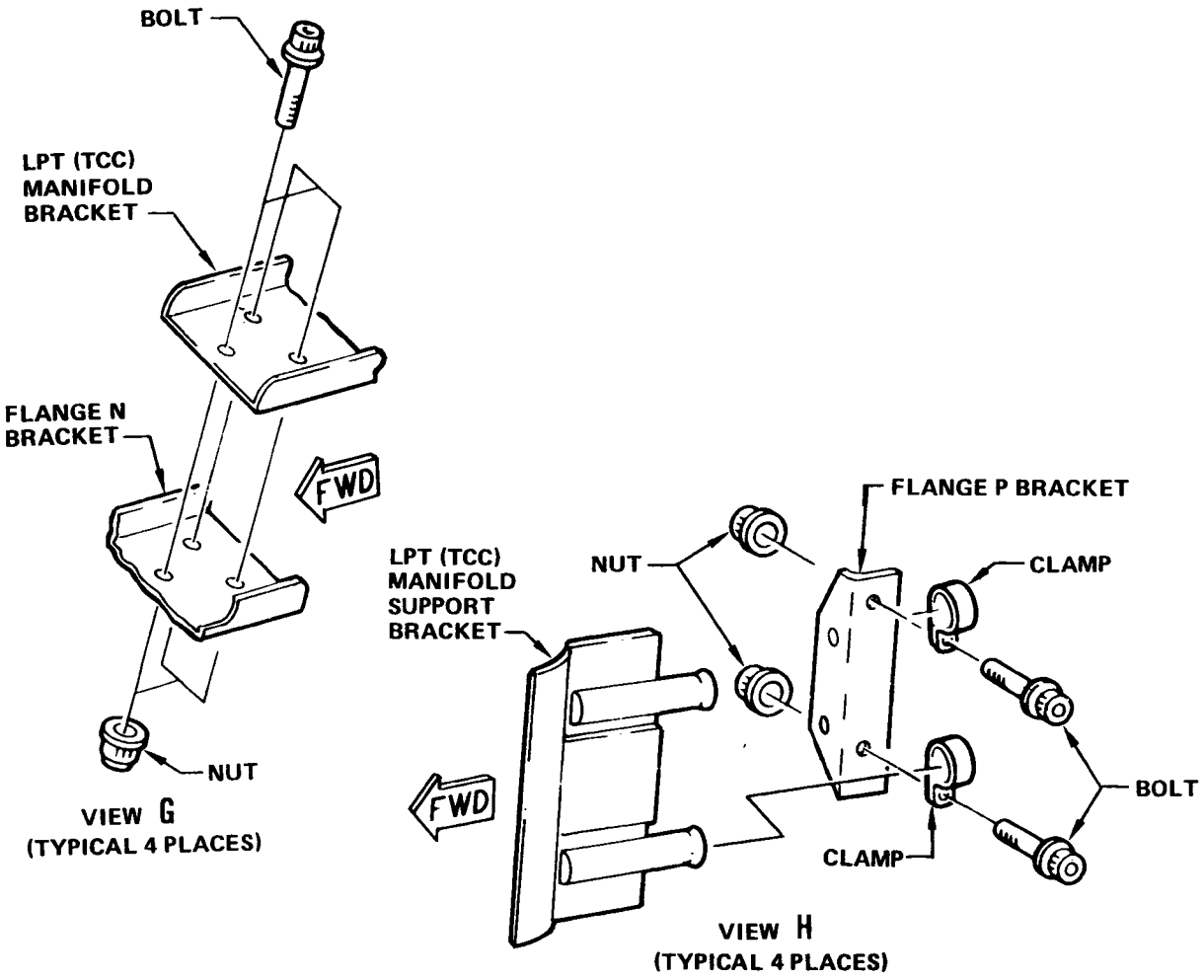
BM5 75 23 09 4 KGME 00

LPT Turbine Case Cooling (TCC) (Manifolds Left Side)
for PHASE III Engine Configuration (Sheet 3/5)
Figure 411



BM5 75 23 09 4 KGMG 00

LPT Turbine Case Cooling (TCC) (Manifolds Left Side)
for PHASE III Engine Configuration (Sheet 4/5)
Figure 411



BM5 75 23 09 4 KGMJ 00

LPT Turbine Case Cooling (TCC) (Manifolds Left Side)
for PHASE III Engine Configuration (Sheet 5/5)
Figure 411

TURBINE CASE COOLING (TCC) INLET DUCT BELLOWS SEAL - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Torque Wrench
C.	Access Platform
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

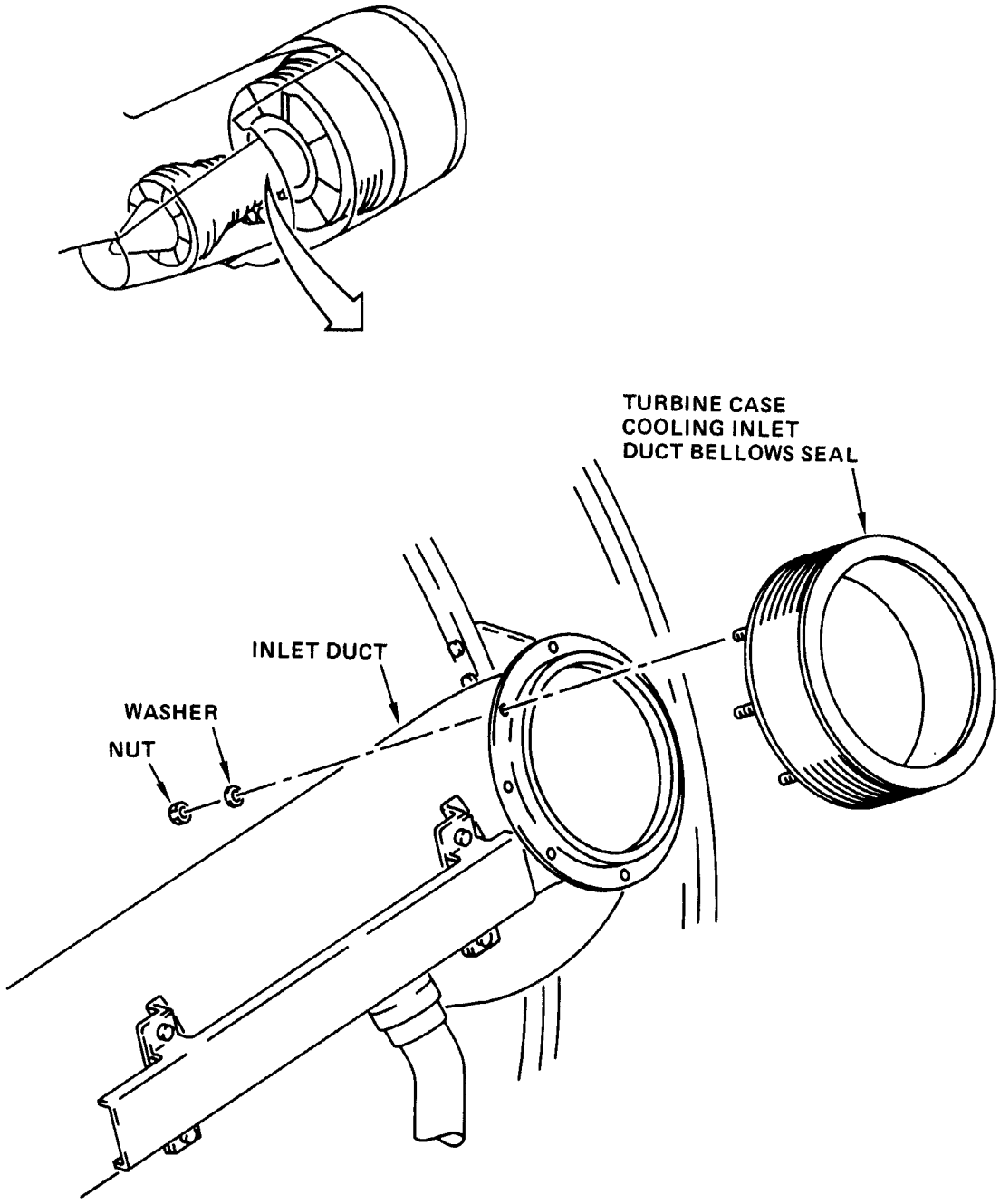
2. Procedure

A. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine.
(2)Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(3)Install access platform.

B. Removal (Ref. Fig. 401)
(1)Remove eight nuts and washers attaching bellows seal to inlet duct flange and remove bellows seal.

C. Installation (Ref. Fig. 401)
(1)Position bellows seal on inlet duct flange, inserting studs through duct flange holes.
(2)Install eight washers and nuts on studs and **TORQUE** nuts to between 50 and 75 lbf. in. (0.56 and 0.85 m.daN).

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers.



BM5 75 23 10 4 KAM0 00

Turbine Case Cooling Inlet Duct Bellows Seal
Figure 401

TURBINE CASE COOLING (TCC) AIR VALVE CONTROL CABLE - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Torque Wrench
D.	Corrosion Resistant Steel Lockwire (AS 3214-02) (Ref. 70-00-00)
E. Material No.P03-001	Oils (Ref.70-00-00)
F. Material No.P05-289	Special Materials (Ref. 70-00-00)
G. Material No.P05-291	Special Materials (Ref. 70-00-00)
H. Material No.P05-292	Special Materials (Ref. 70-00-00)
I.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-23-00, P. Block 501	Automatic Rotor Clearance Control System (ARCCS)

2. Control Cable Assembly

A. Job Set-Up
(1) Open, safety and tag the circuit breakers for the appropriate engine, and open the right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2) Install access platform.

B. Removal (Ref. Fig. 401)
(1) Remove lockwire or safety cable from forward end of turbine case cooling (TCC) air valve control cable and disconnect cable coupling nut (8) from actuator piston shaft.
(2) Remove bolt and nut securing cable rod end bearing to valve idler arm at turbine case cooling (TCC) air shutoff valve (HPT).
(3) Remove lockwire or safety cable from jamnuts (6) at cable rear support bracket (4) and loosen jamnuts.
(4) Remove bolts (12) and nuts (10) securing clamps (9) to cable at the two clamping locations. Remove clamps from cable.
(5) Release forward end of cable from actuator piston shaft. Remove cable from engine.

C. Installation (Ref. Fig. 401)
(1) Ensure bushing (3) in rear of cable (5) is seated by TORQUING nut (2) to between 150 and 200 lbf. in. (1.69 and 2.26 m.daN). While torquing nut hold cable with wrench. Bushing is seated when resistance to torque load increases subtantially. TORQUE not to exceed 300 lbf. in. (3.39 m.daN). Loosen nut one quarter to one hald turn.
(2) Slide turbine case cooling (TCC) air valve actuator (7) forward on mount rails until actuator contacts stop bracket on forward end of mount

bracket.

(3)Lubricate forward coupling nut (8) threads with Material No.P03-001. Engage forward end of cable with actuator piston shaft and tighten coupling nut handtight until seated. Loosen one quarter to one half turn.

(4)Rotate cable (5) until cable seats itself squarely into slot on rear support bracket (4) by handtightening jamnuts (6).

NOTE : Jamnuts (6) on cable must be located on each side of U-shaped slot in support bracket (4) with washers (1) between jamnuts and bracket.

(5)Check to ensure actuator (7) is still against forward bracket stop and that coupling nut (8) turns freely. If coupling nut does not turn freely, repeat steps (2), (3), and (4).

(6)While keeping actuator (7) forward, ensure that rearward end of cable is squarely seated in slot. Tighten forward jamnut against rear support bracket handtight only.

(7)Tighten rear jamnut against support bracket handtight only. While holding rear jamnut with wrench, TORQUE forward jamnut against support bracket and rear jamnut to between 675 and 750 lbf. in. (7.62 and 8.47 m.daN). Install lockwire (Material No.P05-289) or safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety jamnuts.

(8)Check to ensure actuator (7) is still forward against bracket stop and that coupling nut (8) turns freely. If coupling nut does not turn freely, repeat steps (2) through (7).

(9)TORQUE cable coupling nut (8) to between 100 and 175 lbf. in. (1.13 and 1.41 m.daN). Install lockwire (Material No.P05-289) or safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety cable coupling nut.

(10)Secure cable (5) to adjustable brackets (11) with clamps (9), bolts (12) and nuts (10). Lubricate with material No.P03-001. TORQUE bolts to between 85 and 95 lbf. in. (0.96 and 1.07 m.daN).

NOTE : Do not apply stress to cable when installing clamps. If necessary remove lockwire or safety cable from adjusters (13), loosen jamnuts (14) and readjust adjusters (13) to ensure proper clamp to bracket installation.

(11)If adjusters (13) were adjusted comply with the following :

(a)TORQUE jamnuts (14), threads lubricated with Material No.P03-001 to between 14 and 16 lbf. in. (0.16 and 0.18 m.daN). Install lockwire (Material No.P05-289) or safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety jamnuts.

NOTE : Rear of cable rod end bearing will be attached as part of Adjustment/Test procedure.

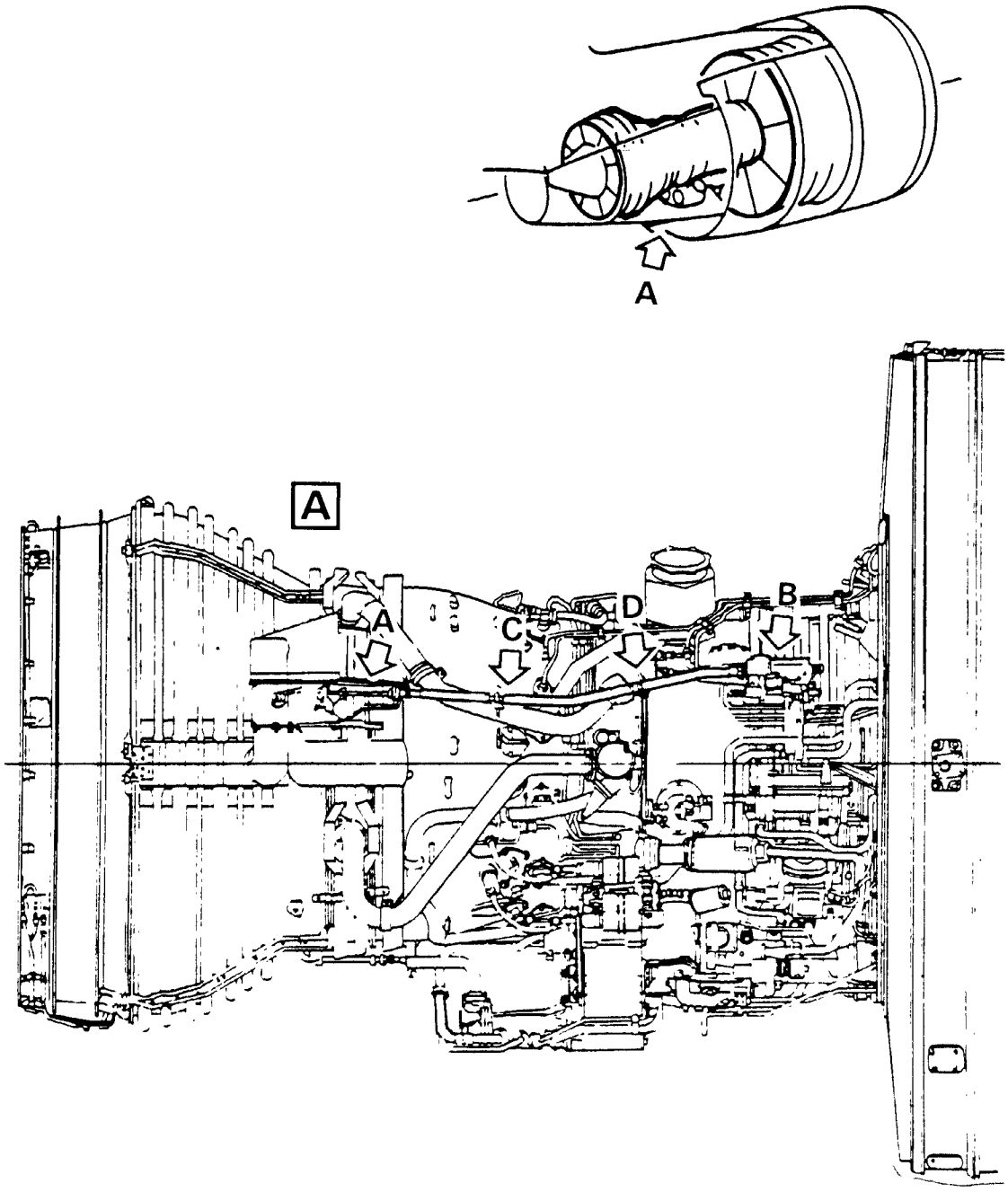
D. Close-Up and Test

(1)Rig automatic turbine rotor clearance control system (Ref. 75-23-00, P. Block 501).

(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(3)Remove access platform.

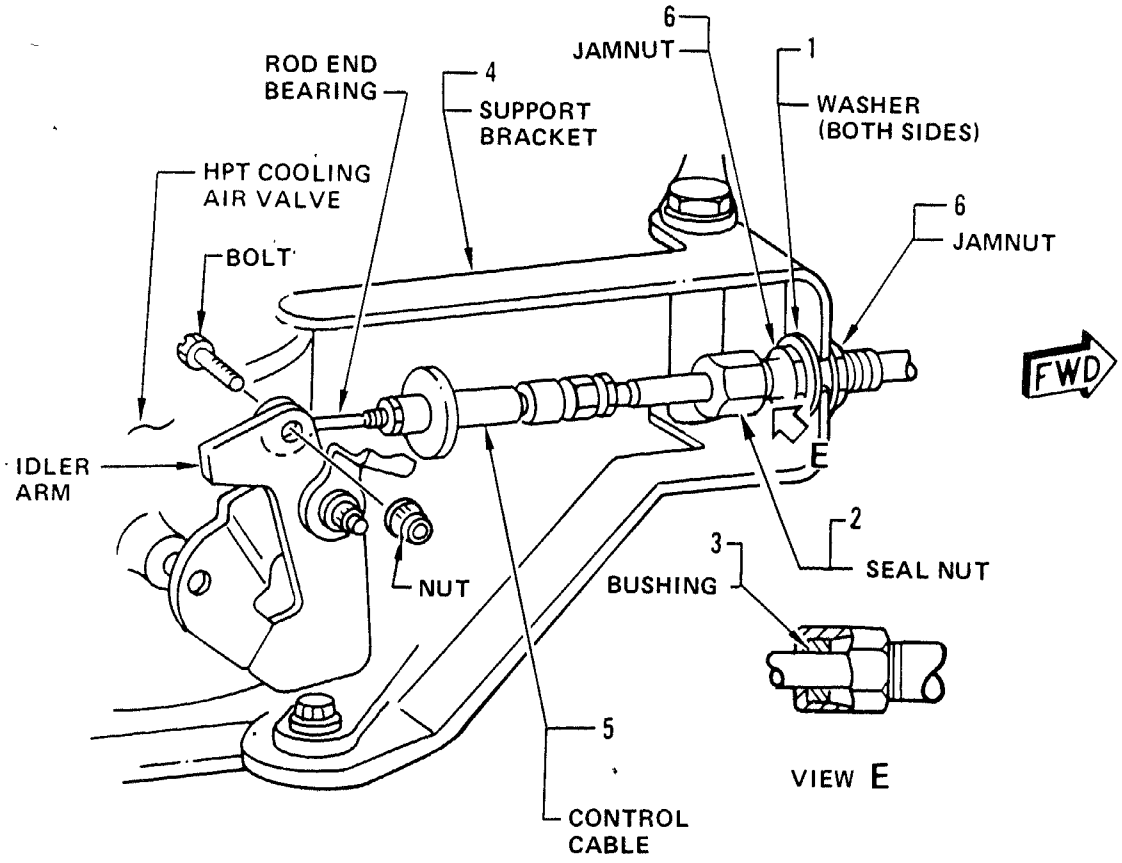
(4)Close right thrust reverser and fan cowl doors, and remove safety clips



L – A2794

BM5 75 23 11 4 KAMA 00

Turbine Case Cooling (TCC) Air Valve Control Cable
(Sheet 1/6)
Figure 401



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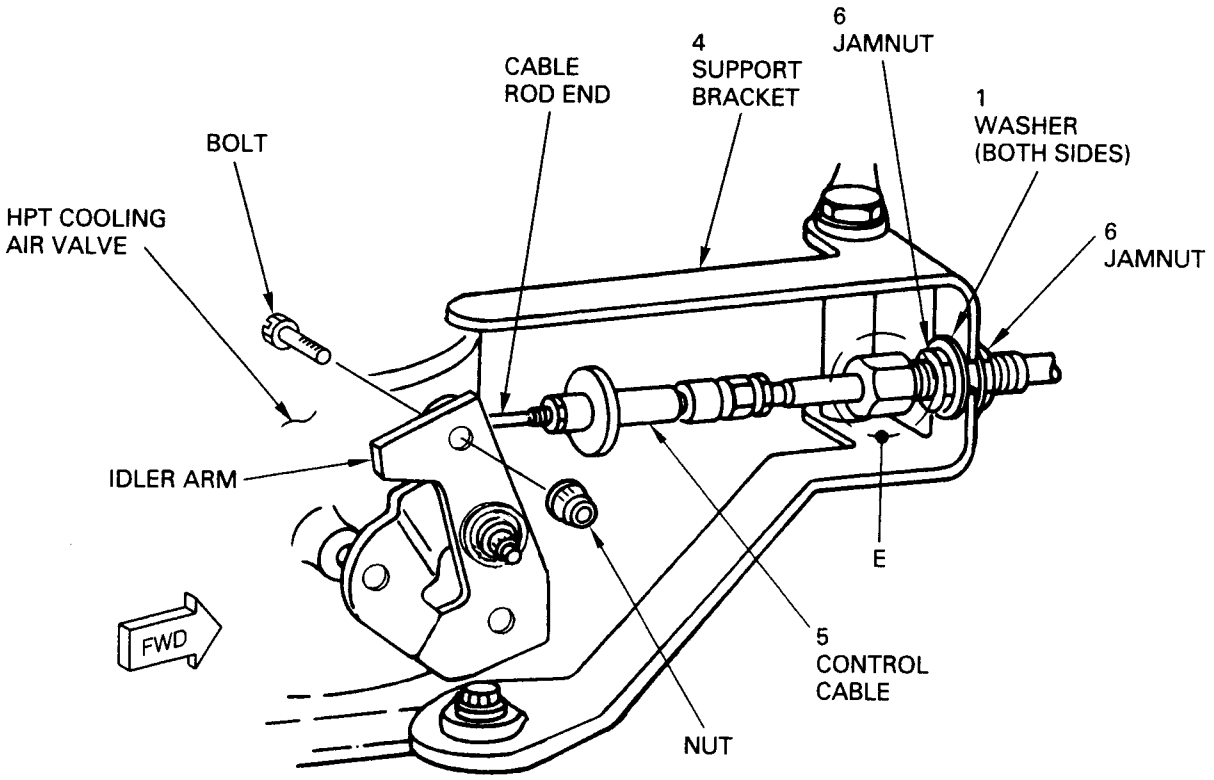
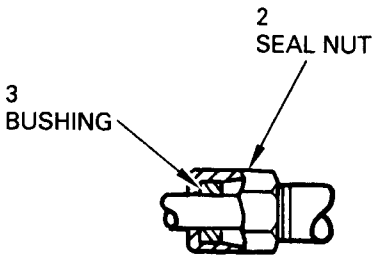
L—A4568

TCC Air Valve Control Cable (Sheet 2/6) (Phase 1 and Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592)
Figure 401



VIEW C



VIEW E

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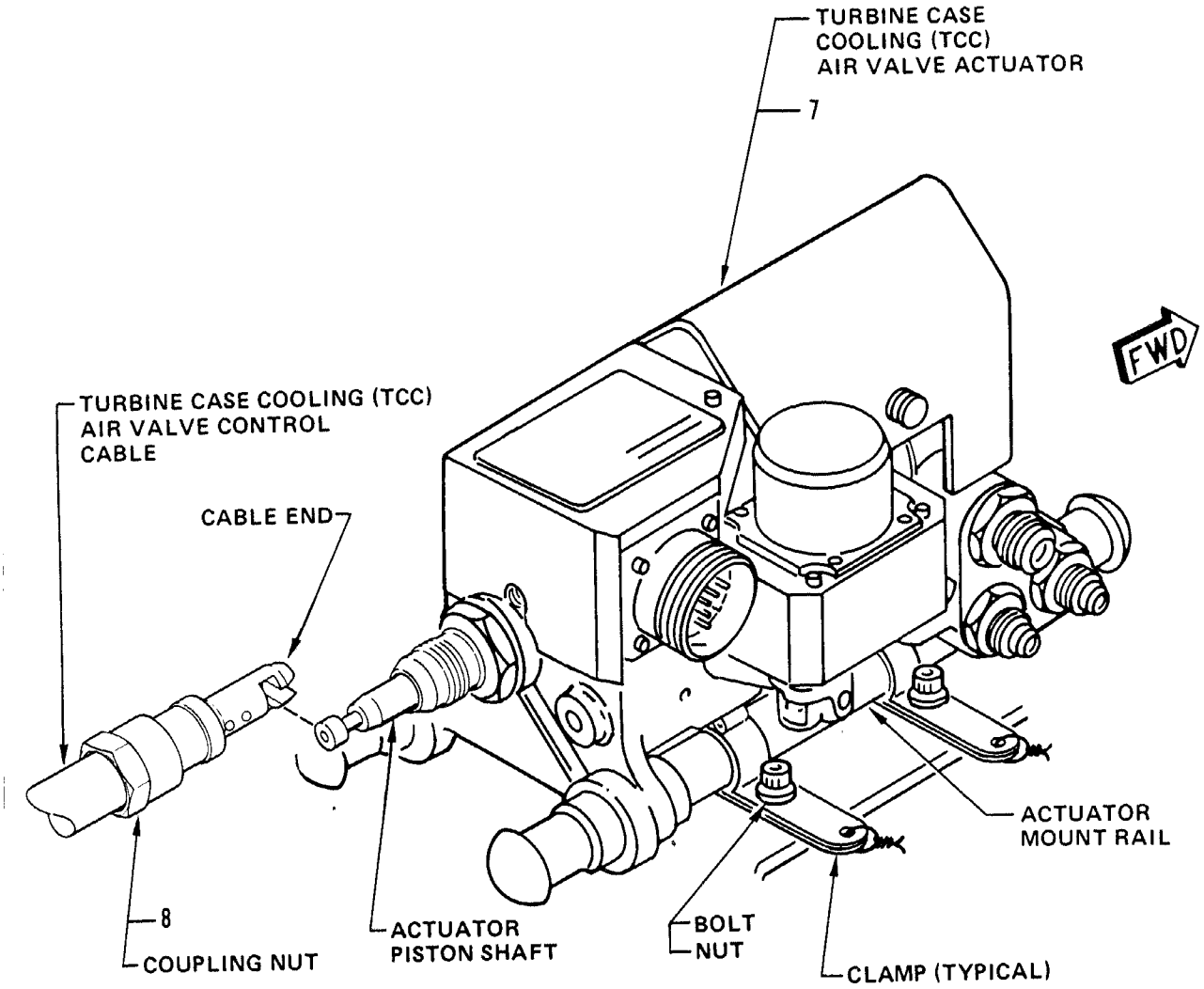
BM5 75 23 11 4 KAMP 00

Turbine Case Cooling (TCC) Air Valve Control Cable
(Phase 3 Engines As Built by P&W) (Sheet 3/6)
Figure 401



VIEW B

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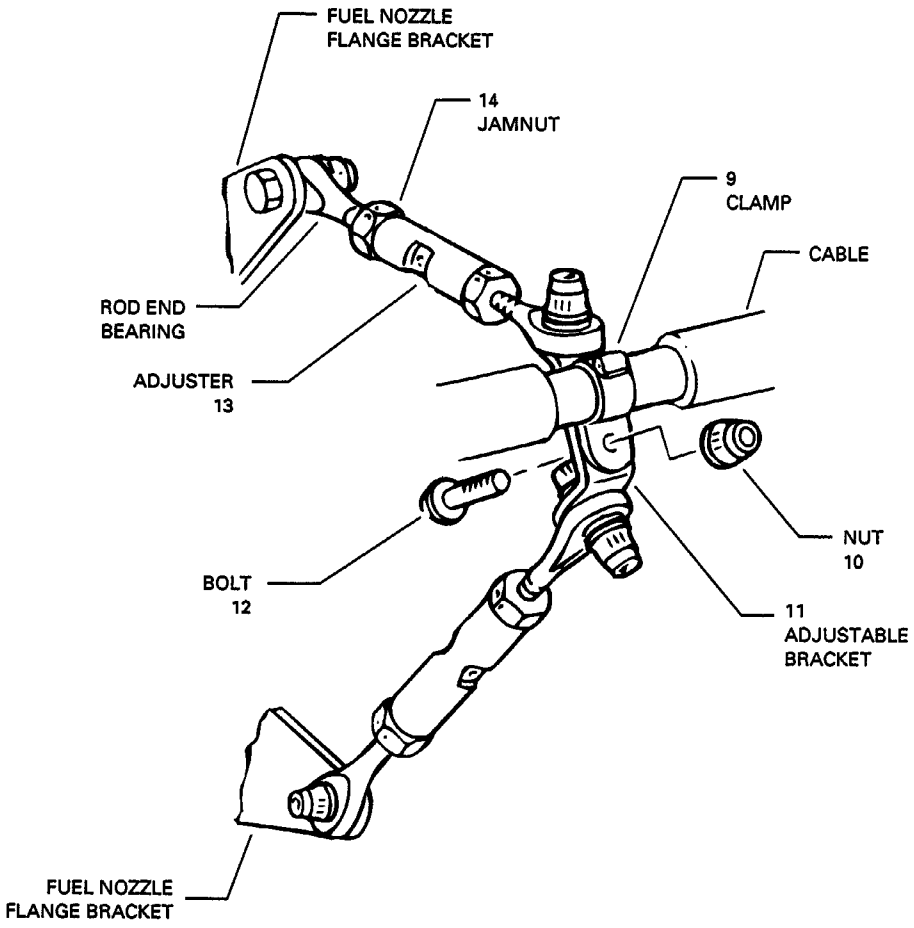
Control Cable and Actuator
(Sheet 4/6)
Figure 401



VIEW **C**

BM5 75 23 11 4 KAMD 00

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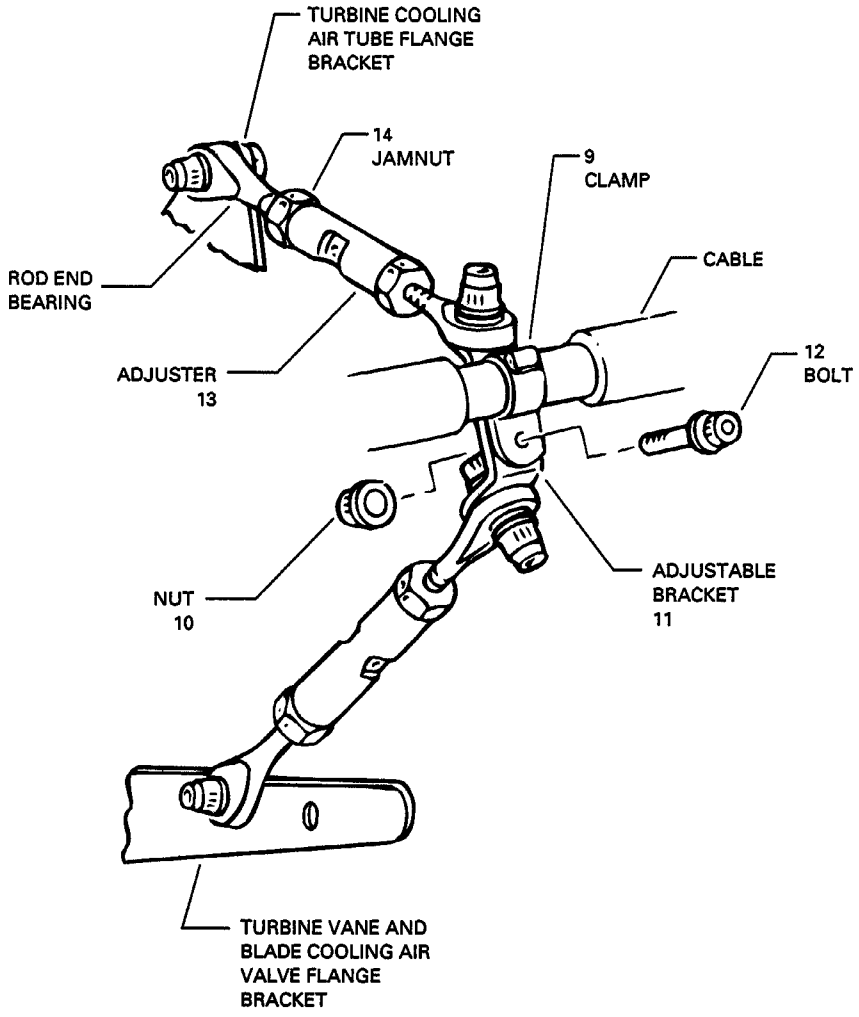
Adjustable Bracket and Clipping Views
(Sheet 5/6)
Figure 401



VIEW **D**

BM5 75 23 11 4 KAME 00

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0889

Adjustable Bracket and Clipping Views
(Sheet 6/6)
Figure 401

and tags and close circuit breakers (Ref 71-13-00, P. Block 301).

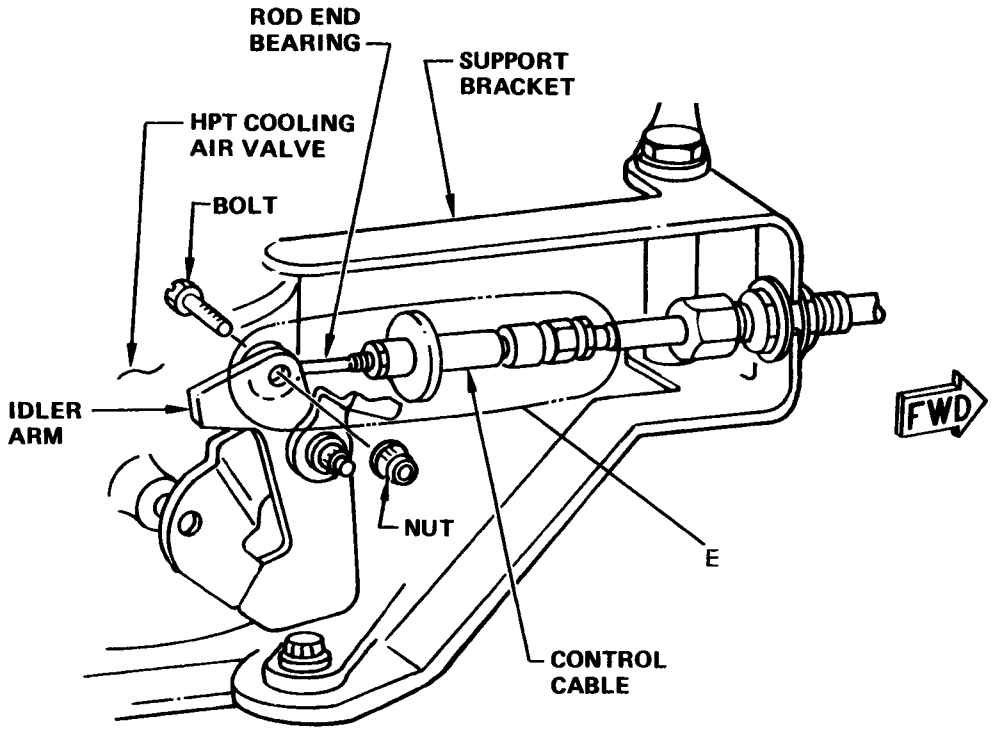
3. TCC Control Cable Ball Joint Assembly

A. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine, and open the right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Removal (Ref. Fig. 401, 402)
(1)Make suitable marks to install removed details in the approximate same location.
(2)Remove bolt and nut securing cable rod end bearing to valve idler arm at turbine case cooling (TCC) air shutoff valve (HPT).
(3)Remove lockwire or safety cable from jam nut (2) and flange of ball joint assembly (3).
(4)Remove rod end bearing (1) and jam nut (2) from ball joint assembly (3). Do not move jam nut on the rod end bearing.
(5)Remove lockwire or safety cable from ball joint assembly (3) and jam nut (4).
(6)Remove ball joint assembly (3) but, do not move jam nut (4) from end rod of cable assembly.

C. Installation (Ref. Fig. 401, 402)
(1)Put Material No.P03-001 on all threaded details before you assemble the cable.
(2)Use previously made marks to assemble details to their approximate original location.
(3)Insert ball joint assembly (3) onto end rod of cable assembly to butt against jam nut (4). Tighten and TORQUE jam nut (4) to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN). Install lockwire (Material No.P05-289) or safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292) to safety ball joint assembly (3) to jamnut (4).
(4)Insert rod end bearing (1) with installed jam nut (2) onto ball joint assembly (3). Do not safety at this time. Adjustment/Test procedure will secure jam nut (2) to ball joint assembly (3).

D. Close-Up and Test
(1)Rig automatic turbine rotor clearance control system (Ref. 75-23-00, P. Block 501).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Remove access platform.
(4)Close right thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

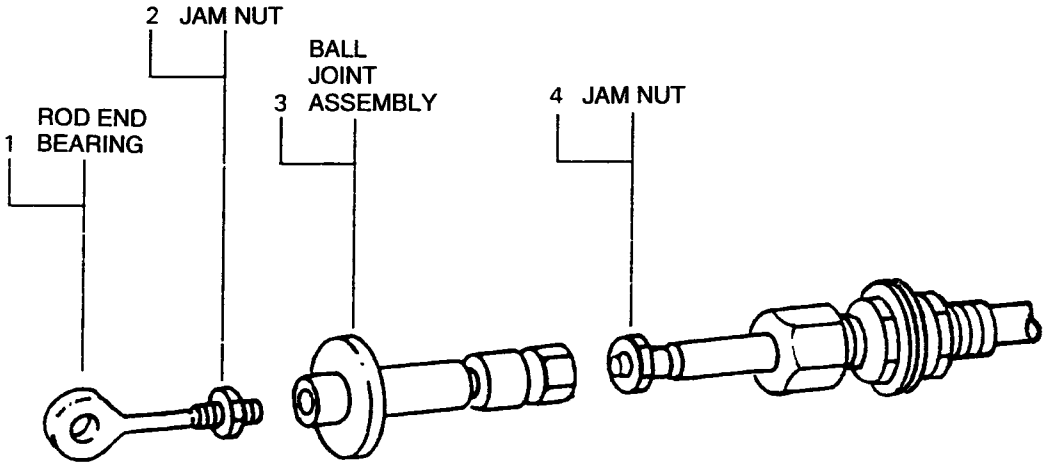


VIEW A

L-B2256 (0000)

BM5 75 23 11 4 KCMA 00

TCC Control Cable Ball Joint Assembly
(Sheet 1/3)
Figure 402

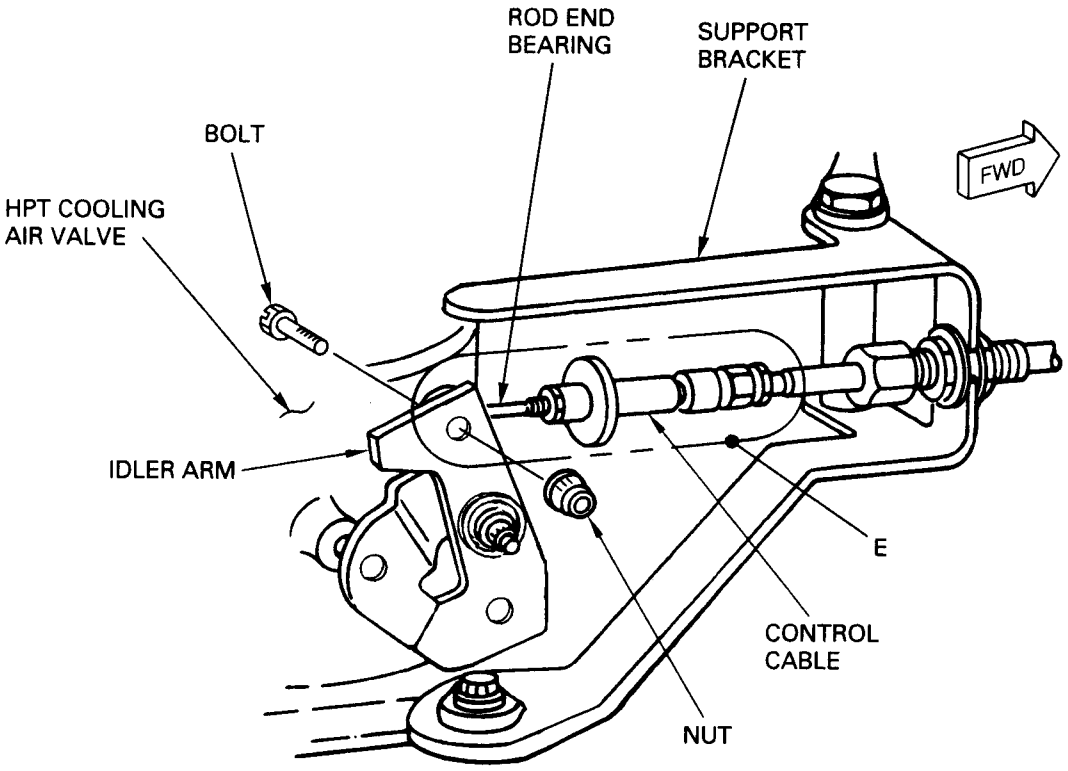


VIEW E

L-B2257 (0000)

BM5 75 23 11 4 KCMJ 00

TCC Control Cable Ball Joint Assembly (Sheet 2/3) (Phase 1 and Post SB PW4ENG 72-572 and Post SB PW4ENG 72-592)
Figure 402



VIEW C

BM5 75 23 11 4 KCMS 00

L-B6266 (0398)

TCC Control Cable Ball Joint Assembly
(Phase 3 Engines As Built by P&W) (Sheet 3/3)
Figure 402

TURBINE CASE COOLING (TCC) INLET DUCT - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Torque Wrench
B. Material No.P03-005	Oils (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

2. Procedure (Ref. Fig. 401)

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

2. Procedure (Ref. Fig. 402)

**ON A/C 101-200,

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the thrust reverser doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Removal
(1)Remove four nuts, washers and bolts attaching hydraulic hose support bracket to TCC inlet duct.
(2)Remove two nuts, washers and bolts attaching TCC inlet duct to wire support bracket and plate.
(3)Remove ignition cooling duct coupling nut to disconnect cooling duct from TCC inlet duct.
(4)Remove PMA cooling duct coupling nut to disconnect cooling duct from TCC inlet duct (Post SB PW4NAC 75-9 only).
(5)Remove eight bolts and washers attaching TCC inlet duct to TCC valve.
(6)Work TCC inlet duct forward and out to remove.

C. Installation
(1)Work TCC inlet duct aft behind the hydraulic hose support bracket and position to attach to TCC valve.
(2)Lubricate eight bolts with Lubricating Oil (Material No.P03-005) and attach aft end of TCC inlet duct with bolts and washers to TCC valve. TORQUE bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).
(3)Attach forward end of TCC inlet duct and wire support bracket to plate with bolts, washers and nuts. TORQUE nuts to between 100 and 140 lbf.in. (1.14 and 1.58 m.daN).
(4)Connect PMA cooling duct coupling to TCC duct. TORQUE coupling nut to between 100 and 120 lbf.in. (1.14 and 1.35 m.daN) (Post SB PW4NAC 75-9

only).
(5)Connect ignition cooling duct coupling to TCC inlet duct. TORQUE coupling nut to between 215 and 240 lbf.in. (2.44 and 2.71 m.daN).
(6)Attach hydraulic hose support bracket to TCC duct with bolts, washers and nuts. TORQUE nuts to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN).

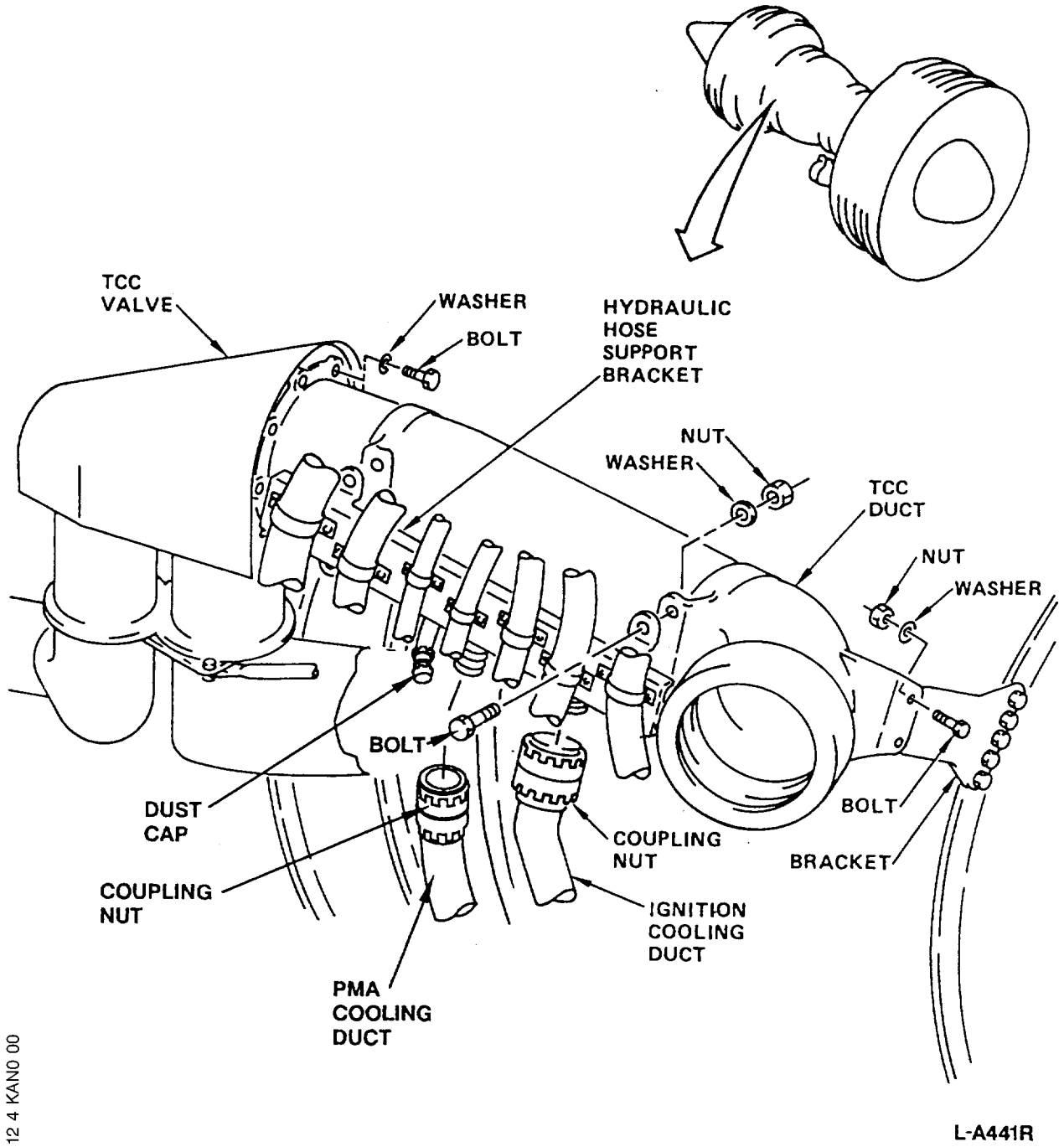
R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

C. Installation
(1)Position the aft gasket between the TCC valve and the TCC duct mating surfaces (Post SB PW4NAC 71-139).
(2)Work TCC inlet duct aft behind the hydraulic hose support bracket and position to attach to TCC valve.
(3)Lubricate eight bolts with Lubricating Oil (Material No.P03-005) and attach aft end of TCC inlet duct with bolts and washers to TCC valve. TORQUE bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).
(4)Position the aft gasket between the bellows and the TTC duct forward flange (Post SB PW4NAC 71-139).
NOTE : Install the gasket with the metal beads facing forward.
(5)Install the washers and nuts that attach the bellows to the TCC duct forward flange. TORQUE the nuts to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN) (Post SB PW4NAC 71-139).
(6)Attach forward end of TCC inlet duct and wire support bracket to plate with bolts, washers and nuts. TORQUE nuts to between 100 and 140 lbf.in. (1.14 and 1.58 m.daN).
(7)Connect PMA cooling duct coupling to TCC duct. TORQUE coupling nut to between 100 and 120 lbf.in. (1.14 and 1.35 m.daN) (Post SB PW4NAC 75-9 only).
(8)Connect ignition cooling duct coupling to TCC inlet duct. TORQUE coupling nut to between 215 and 240 lbf.in. (2.44 and 2.71 m.daN).
(9)Attach hydraulic hose support bracket to TCC duct with bolts, washers and nuts. TORQUE nuts to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN).

**ON A/C 101-200,

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser cowl doors (Ref. 71.13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers.



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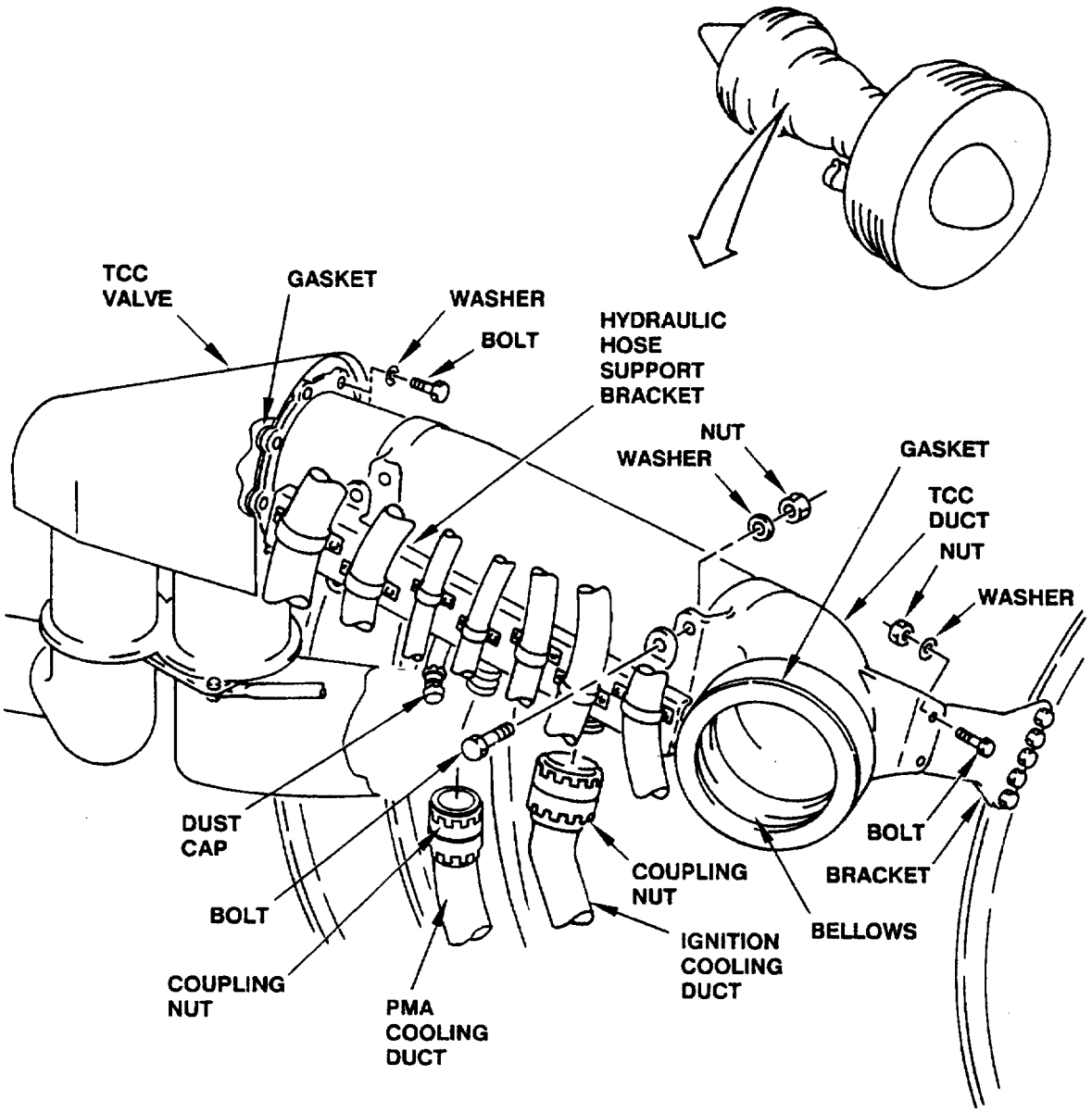
Turbine Case Cooling Inlet Duct (Post SB PW4NAC 75-9)
Figure 401



L-A441R (1298)

BM5 75 23 12 4 KAR0 00

Turbine Case Cooling Inlet Duct
(Post SB PW4NAC 75-9 and Post SB PW4NAC 71-139)
Figure 402

R TURBINE COOLING AIR SYSTEM - DESCRIPTION AND OPERATION

1. General
This system is used to send 12th stage compressor air to the 2nd stage turbine components for cooling requirements under all engine operating conditions.
Portions of the system are shut off at cruise to enhance performance.

2. Component Location (For Phase I Engine Configuration)
(Ref. Fig. 001, 003)

FIN	FUNCTIONAL DESIGNATION	PANEL	ZONE	ACCESS DOOR	ATA REF.
	VALVES - AIR TURBINE AND BLABE COOLING	454		452AR	75-24-01
	FILTER-TURBINE VANE AND	453		435AL	75-24-14
	BLADE COOLING AIR VALVE	464		462AR	75-24-01
		454		436AR	75-24-14
		463		445AL	75-24-14
		464		446AR	75-24-14

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

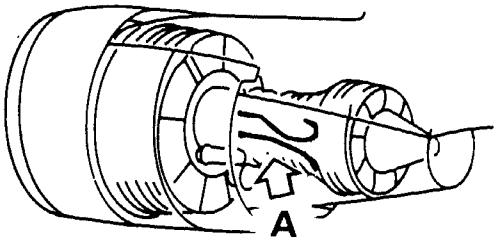
2. Component Location (For Phase III Engine Configuration)
AUTOMATIC TURBINE ROTOR CLEARANCE CONTROL SYSTEM (ATRCCS)
(Ref. Fig. 002, 004)

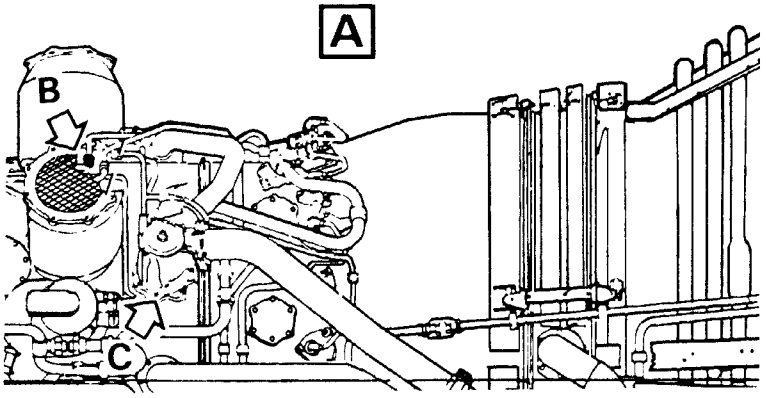
FIN	FUNCTIONAL DESIGNATION	PANEL	ZONE	ACCESS DOOR	ATA REF.
	VALVE - AIR TURBINE VANE AND BLADE COOLING	453		435AL	75-24-01
		454		436AR	75-24-01
		463		445AL	75-24-01
		464		446AR	75-24-01
	VALVE - AIR TURBINE VANE COOLING	453		436AR	75-24-16
		463		446AR	75-24-16
	FILTER - TURBINE VANE COOLING AIR	453		435AL	75-24-14
	VALVE - TURBINE VANE AND BLADE	454		436AR	75-24-14
	COOLING AIR VALVE	463		445AL	75-24-14
		464		446AR	75-24-14

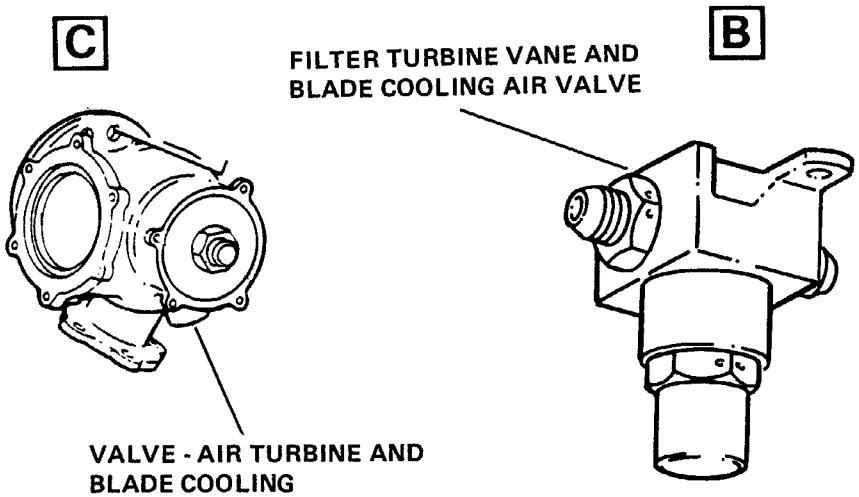
**ON A/C 101-200,

3. Turbine Cooling Air System (TCA) for Phase I Engine Configuration

A. Description (Ref. Fig. 005, 007, 009)







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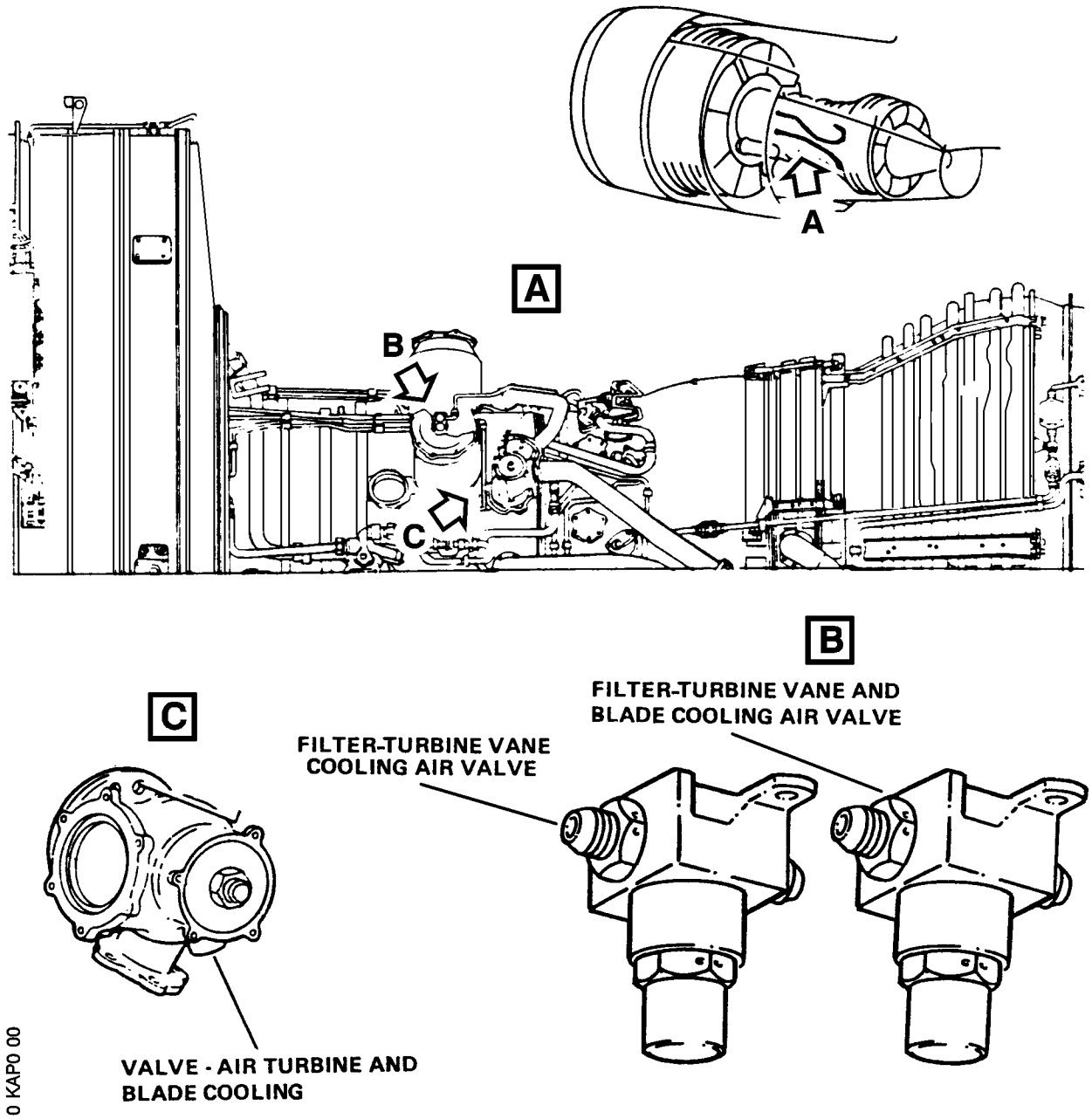
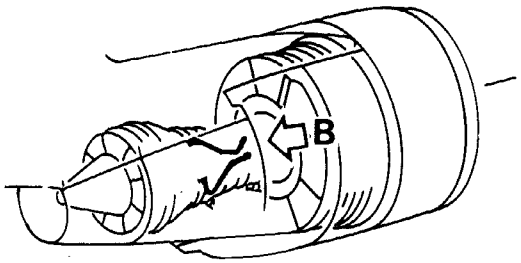
DM5

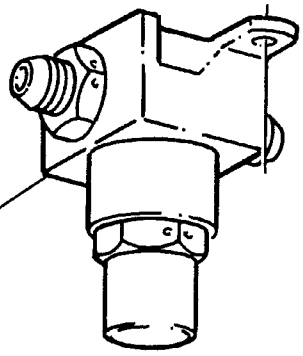
ATRCCS - Left Side - Component Location
(For Phase I Engine Configuration)
Figure 001



ATRCCS - Left Side - Component Location
(For Phase III Engine Configuration)
Figure 002

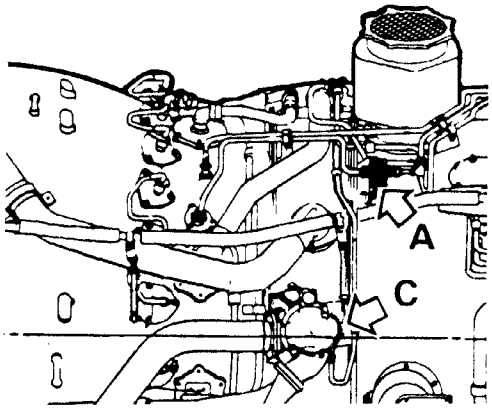


A



FILTER TURBINE VANE
AND BLADE COOLING AIR VALVE

B



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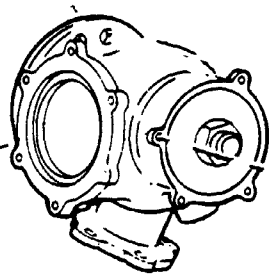

VALVE - AIR TURBINE AND
BLADE COOLING

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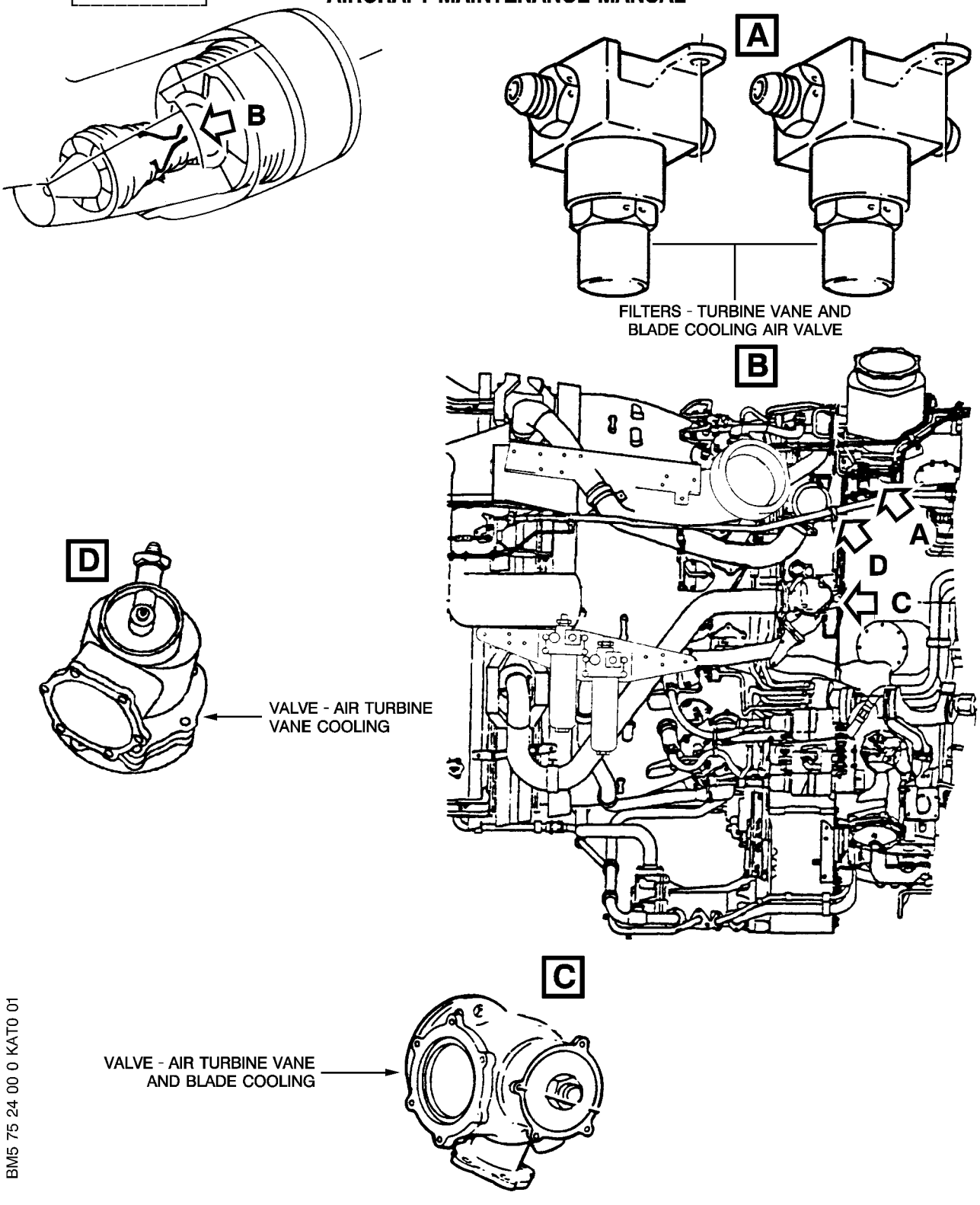
ATRCCS - Right Side - Component Location
(For Phase I Engine Configuration)
Figure 003



BM5 75 24 00 0 KAT0 01

ATRCCS - Right Side - Component Location
(For Phase III Engine Configuration)
Figure 004

The turbine vane cooling air valves provide 12th stage cooling air to the turbine 2nd stage vanes.
The TCA vane cooling system is comprised of two separate manifold systems. One system consists of two TCA valves and manifolds, one of each on each side of the engine, that provide 12th stage cooling air at any time, except cruise and operate as a function of N2 and altitude. The other system has two external manifolds one on each side of the engine that continuously direct 12th stage cooling air to the 2nd stage vanes.
Each of the above systems is installed on each side of the turbine.
The two valves are located on the high pressure compressor case at approximately 3 and 10 o'clock positions.

B. Operation (Ref. Fig. 010)
The TCA valves are normally open, pneumatically actuated valves.
Actuation is accomplished when pneumatic servo pressure (15th stage) is supplied to the TCA valve by a solenoid valve.
The TCA solenoid is an integral part of a 4 way solenoid valve package which contains a second solenoid valve controlling one of the thermatic rotor control valves.
The full authority digital electronic control (FADEC) controls the two TCA vanes via the solenoid.
One of TCA valve is equipped with a position switch which permit to the FADEC to know the TCA valves position.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

3. Turbine Cooling Air System (TCA) for Phase III Engine Configuration

A. Description (Ref. Fig. 006, 008)
The turbine vane cooling air valves provide 12th stage cooling air to the turbine 2nd stage vanes.
The TCA vane cooling system is comprised of two separate manifold systems. One system consists of two Turbine Blade and Vane Cooling Air Valves (TBVC) and manifolds, one of each on each side of the engine, that provide 12th stage cooling air at any time, except cruise and operate as a function of N2 and altitude.
The other system consists of one Turbine Vane Cooling Air (TVC) on engine right side and two external manifolds, one on each side of the engine.
The TVC valve position is scheduled as a function of N2 and altitude.
The valves are located on the high pressure compressor case at approximately 2, 3 and 10 o'clock positions.

B. Operation (Ref. Fig. 012, 013, 011)
The valves are normally open, pneumatically actuated valves.
Actuation is accomplished when pneumatic servo pressure (15th stage) is supplied to the valves by two solenoid valves.

The right side TBVC valve is controlled by the FADEC channel A through a single coil solenoid.
This solenoid valve is an integral part of a package which contains a second dual coil solenoid valve to close the IDG override pressure switch. The left side TBVC valve and the TVC valve are controlled by the FADEC through a four-way solenoid valve.

**ON A/C 101-200,

4. Turbine Vane and Blade Cooling Air Valve Filter (Ref. Fig. 014)

A. Description
(1)The air filter assembly consists of a case which houses a cylindrical type filter element which screws into the head assembly. The case screws into the head assembly also.
(2)The head assembly contains a bypass valve (poppet, spring, and valve head).

B. Operation
(1)Filter operation occurs as PS3 (15 stage) air flows through the filter element. A bypass valve opens at 5 psid (34.5 kpad) in the event of excessive filter restriction.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

4. Turbine Vane and Blade Cooling Air Valve Filter (Ref. Fig. 015)

A. Description
(1)The air filter assembly consists of a case which houses a cylindrical type filter element which screws into the head assembly. The case screws into the head assembly also.
(2)The head assembly contains a bypass valve (poppet, spring, and valve head).

B. Operation
(1)Filter operation occurs as PS3 (15 stage) air flows through the filter element. A bypass valve opens at 5 psid (34.5 kpad) in the event of excessive filter restriction.

**ON A/C 101-200,

5. Electrical Supply

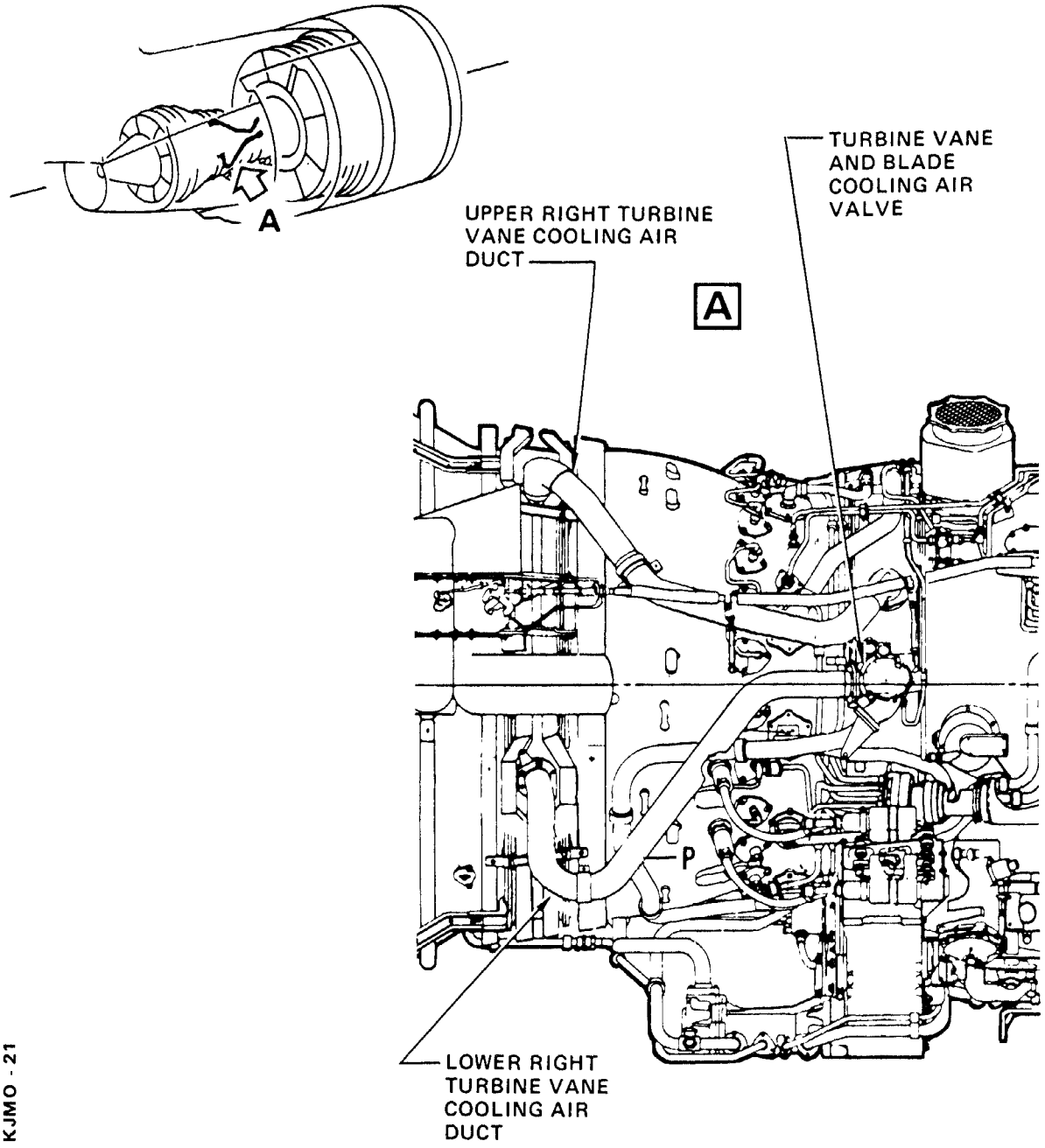
A. Electrical Supply for Phase I Engine Configuration (Ref. Fig. 016)

The electrical power is supplied by the aircraft normal busbar 101PP (FADEC channel A).
The FADEC channel A sends an electrical signal to the TCA solenoid which then actuates both the TCA valves.
The TCA valve is equipped with a position switch which sends an electrical signal to the FADEC.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

A. Electrical Supply for Phase III Engine Configuration (Ref. Fig. 017)
The electrical power is supplied by the aircraft normal busbar 101PP (FADEC channel A).
The FADEC channel A sends an electrical signal to the TCA solenoid which then actuates both the TCA valves.



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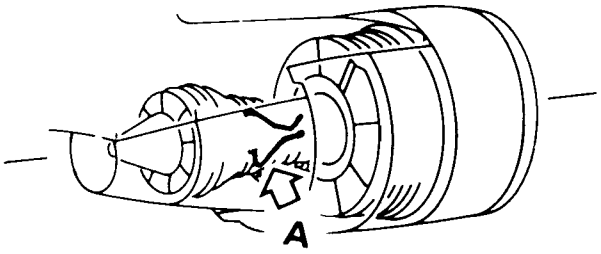
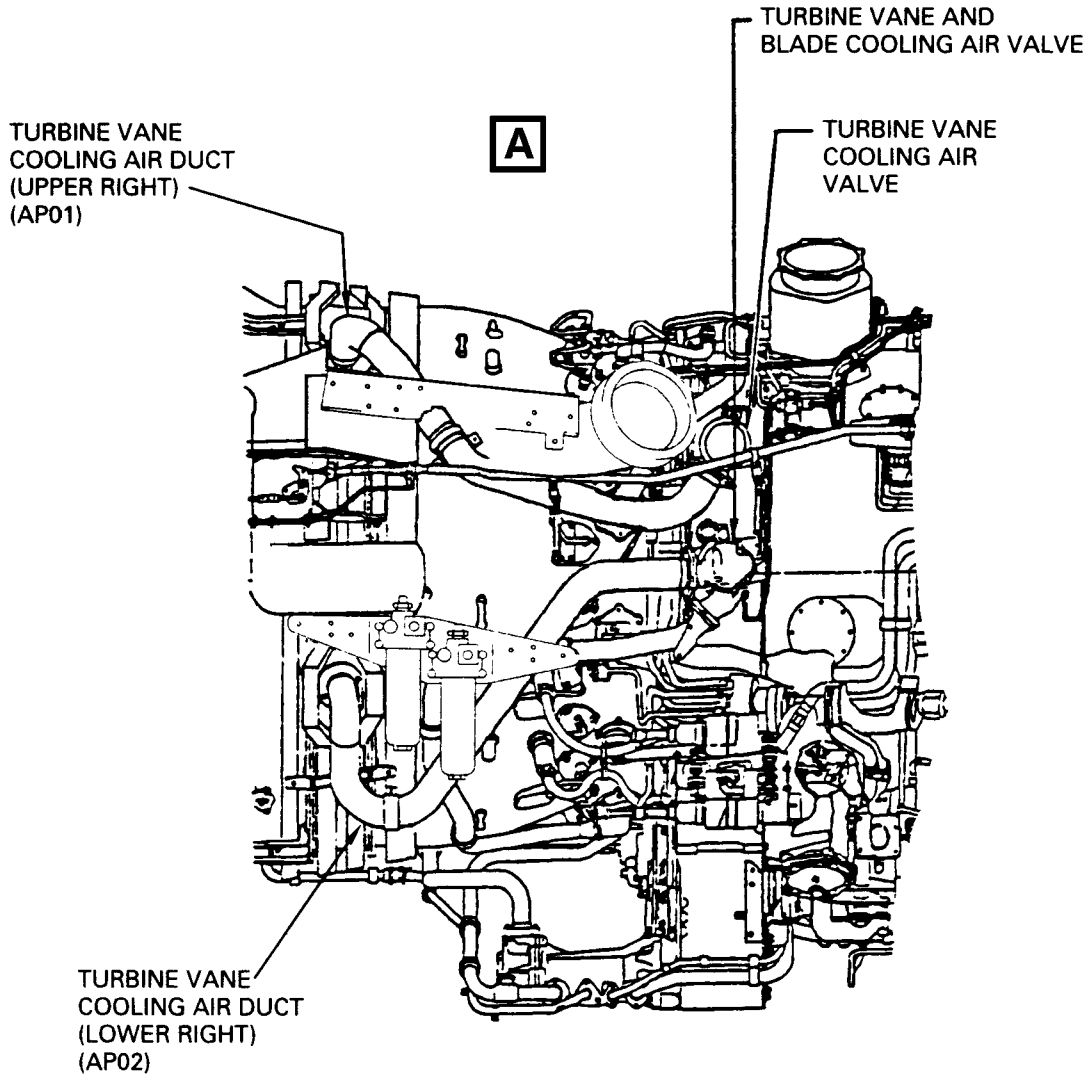
Turbine Cooling Air System (Right Side for Phase I Engine Configuration)
Figure 005





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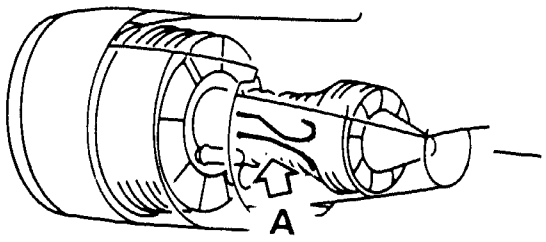
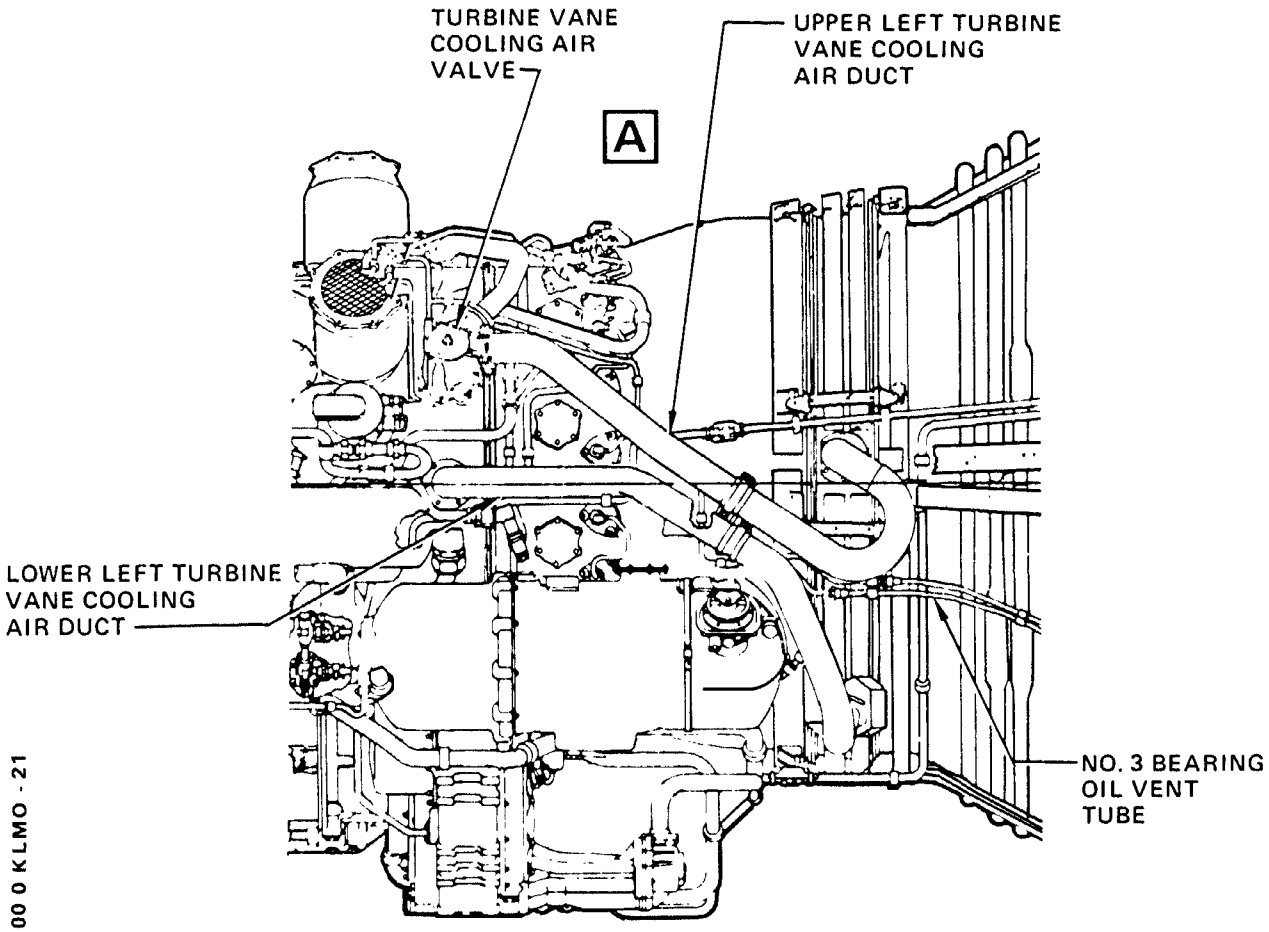
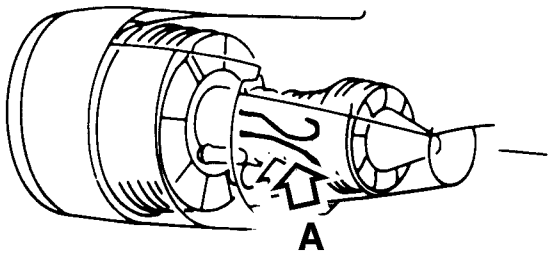
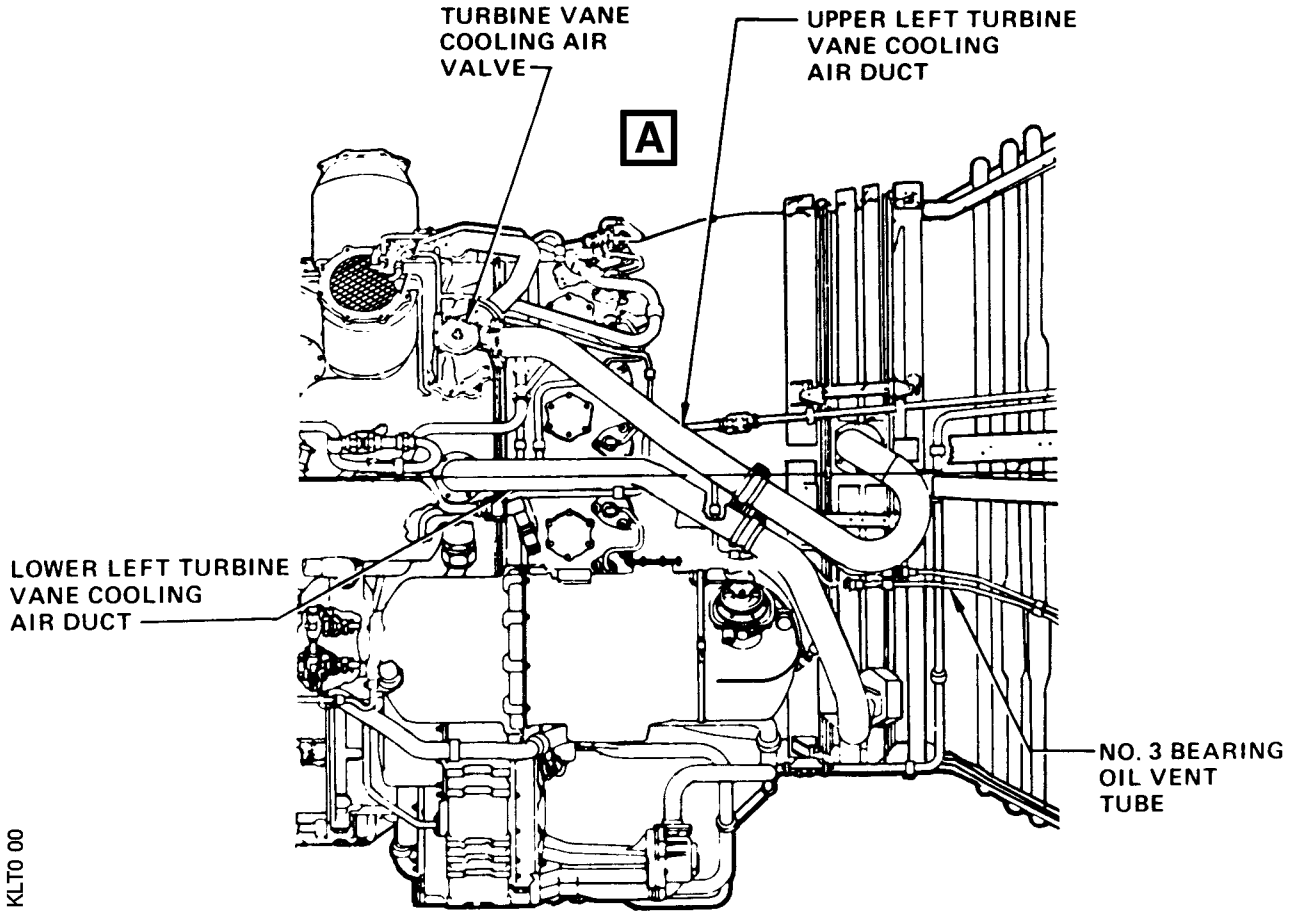
Turbine Cooling Air System (Right Side)
(for Phase III Engine Configuration)
Figure 006



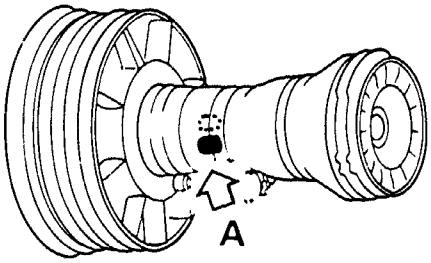


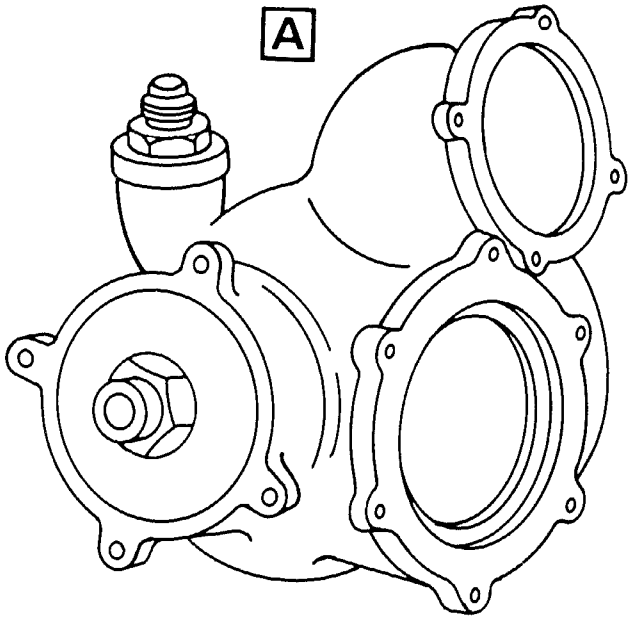
Turbine Cooling Air System (Left Side
for Phase I Engine Configuration)
Figure 007





Turbine Cooling Air System (Left Side)
(for Phase III Engine Configuration)
Figure 008

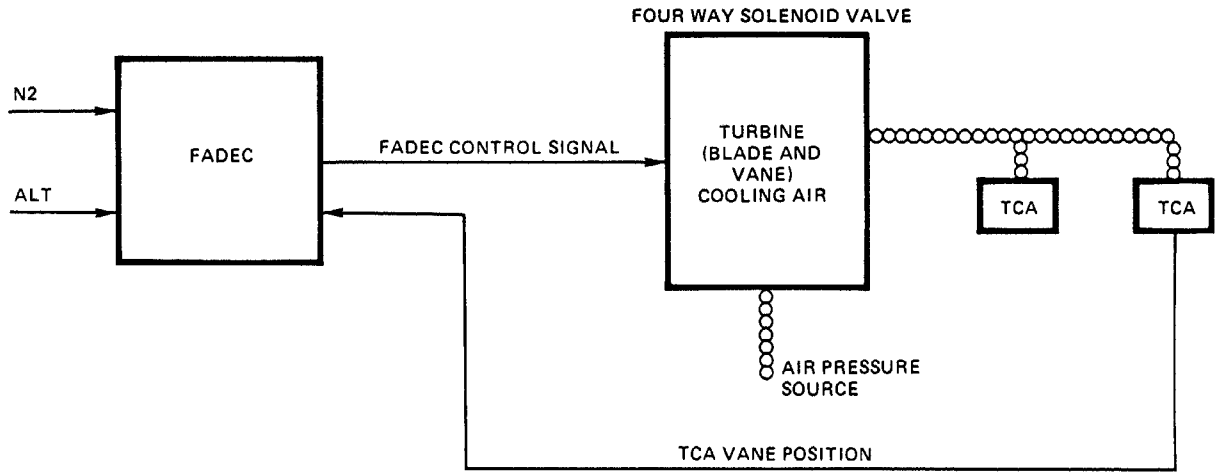




BM5 75 24 00 0 KNMO .21

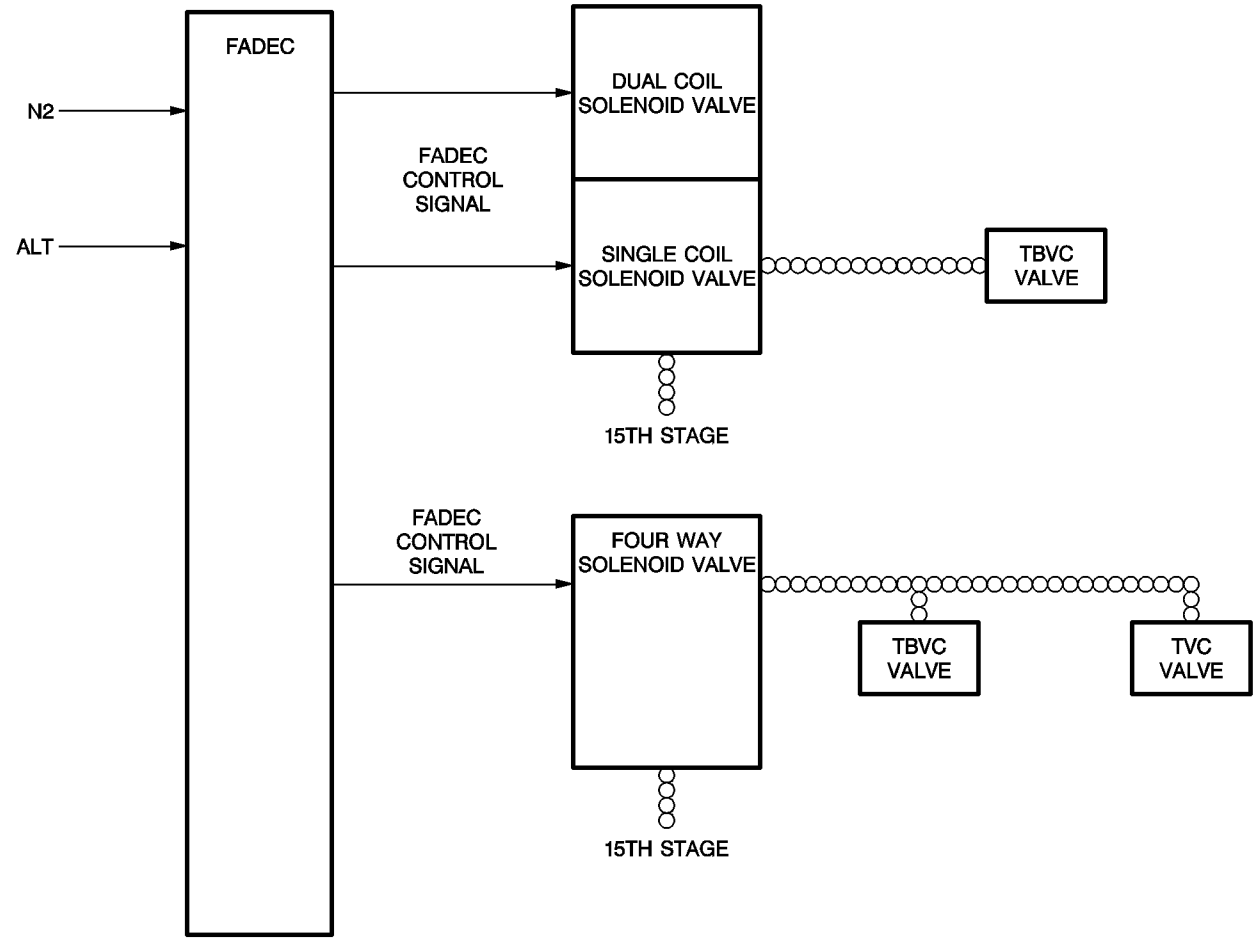
L-A1088

Turbine Vane Cooling Air Valves
(for Phase I Engine Configuration)
Figure 009



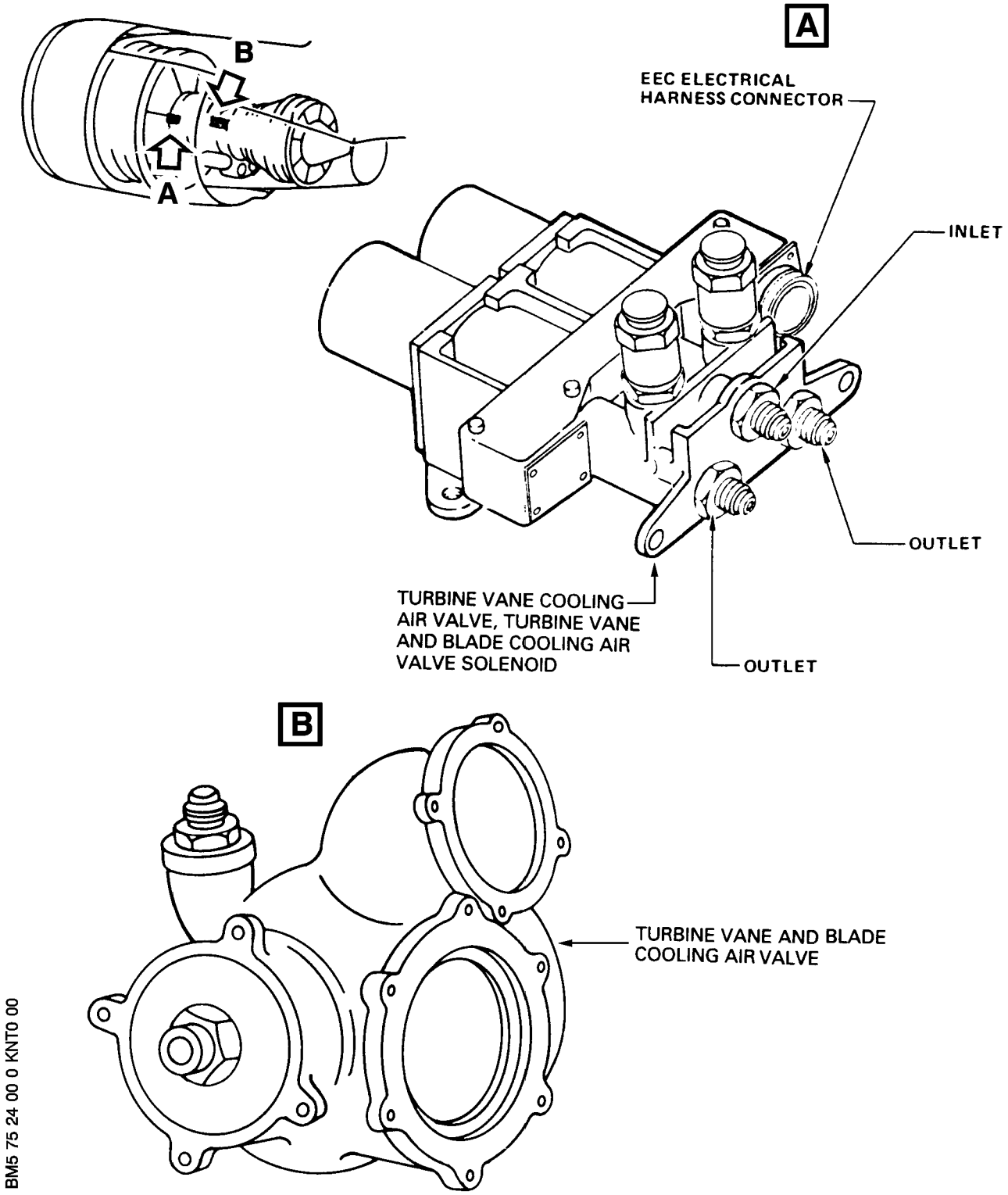
BM5 75 24 00 0 KRMO-21

TCA Schematic Control System
(for Phase I Engine Configuration)
Figure 010

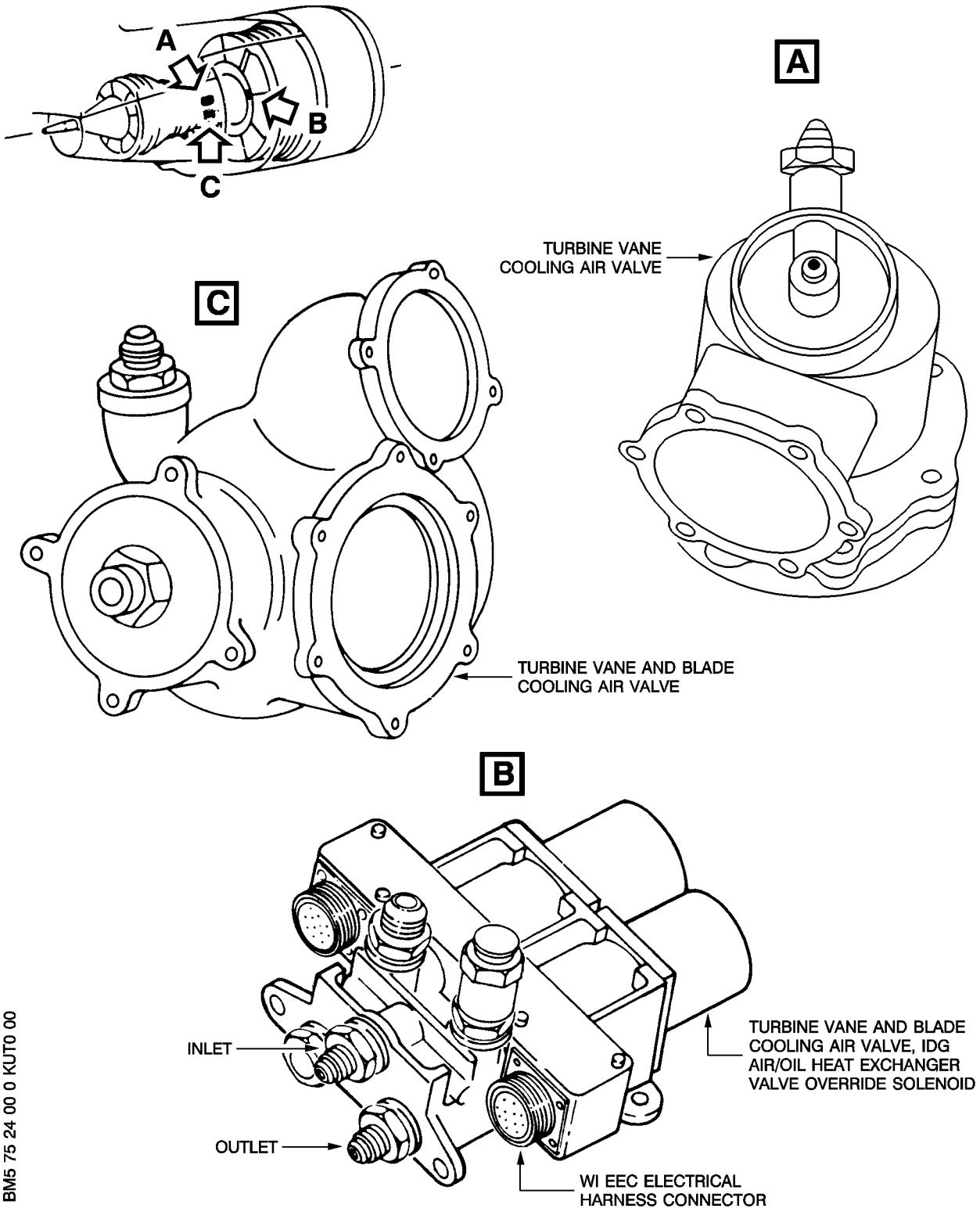


BM5 75 24 00 0 KRT0 00

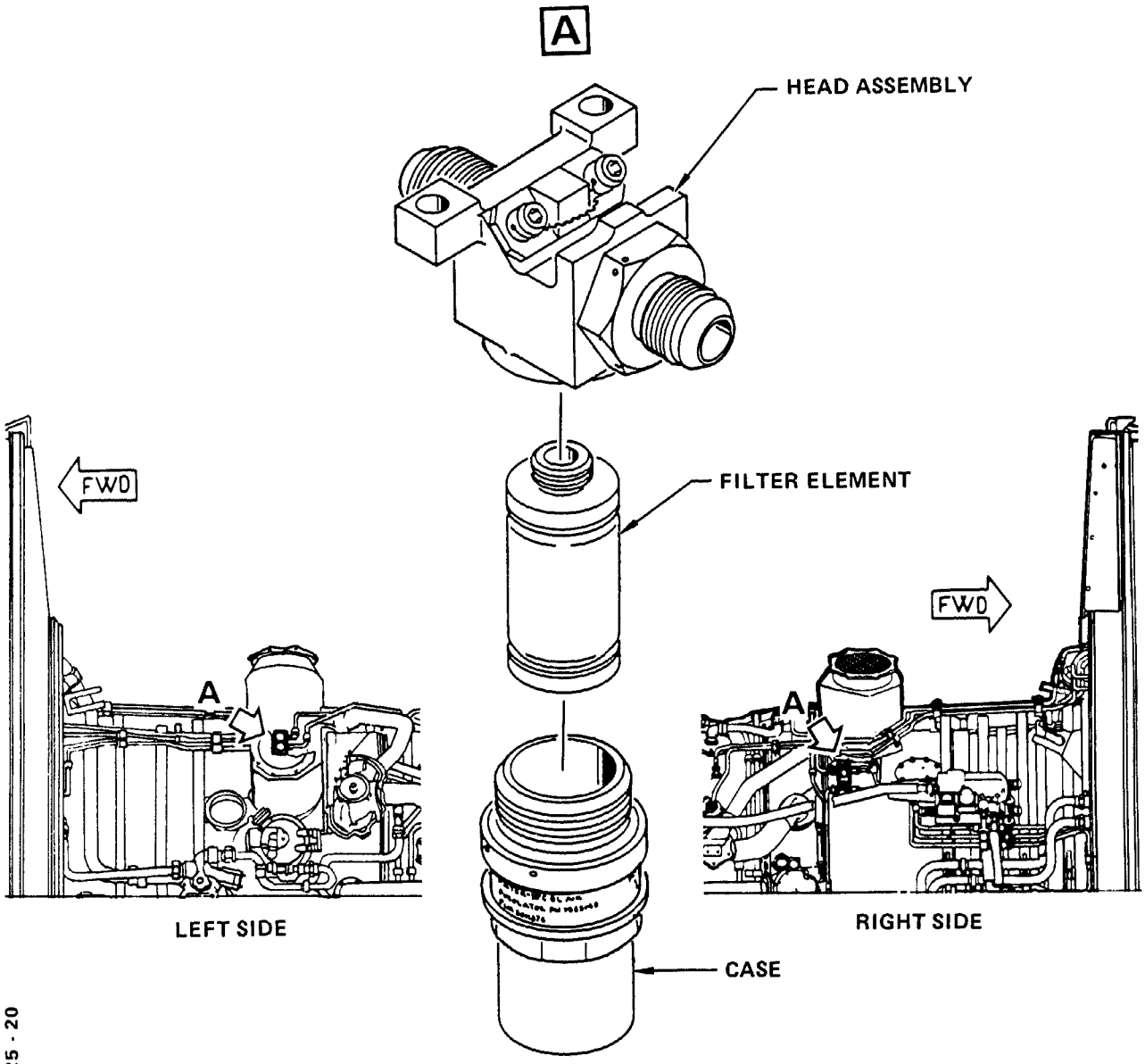
TCA Schematic Control System
(for Phase III Engine Configuration)
Figure 011



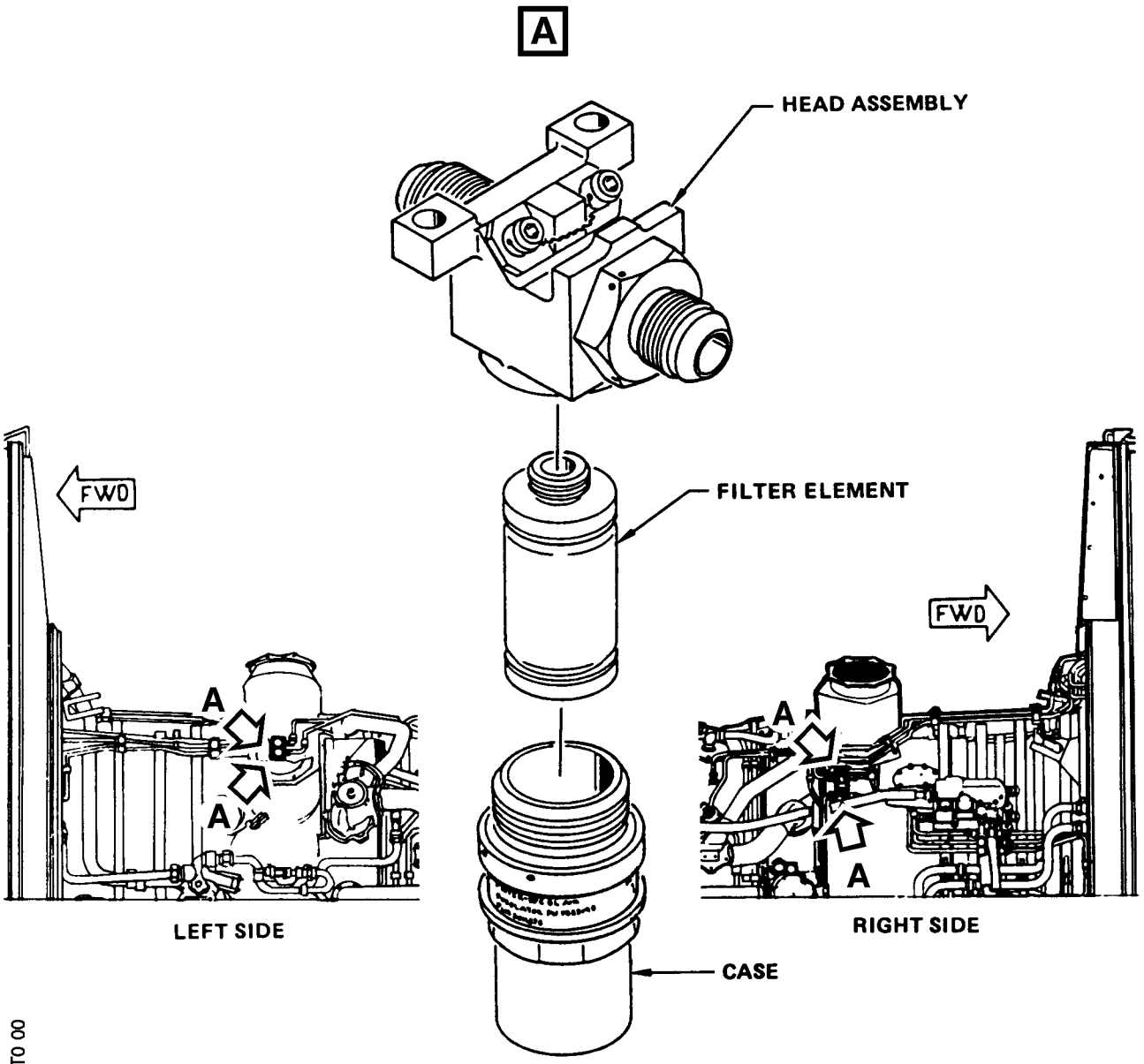
TCA Valve and Solenoid (Left Side for Phase III Engine Configuration)
Figure 012



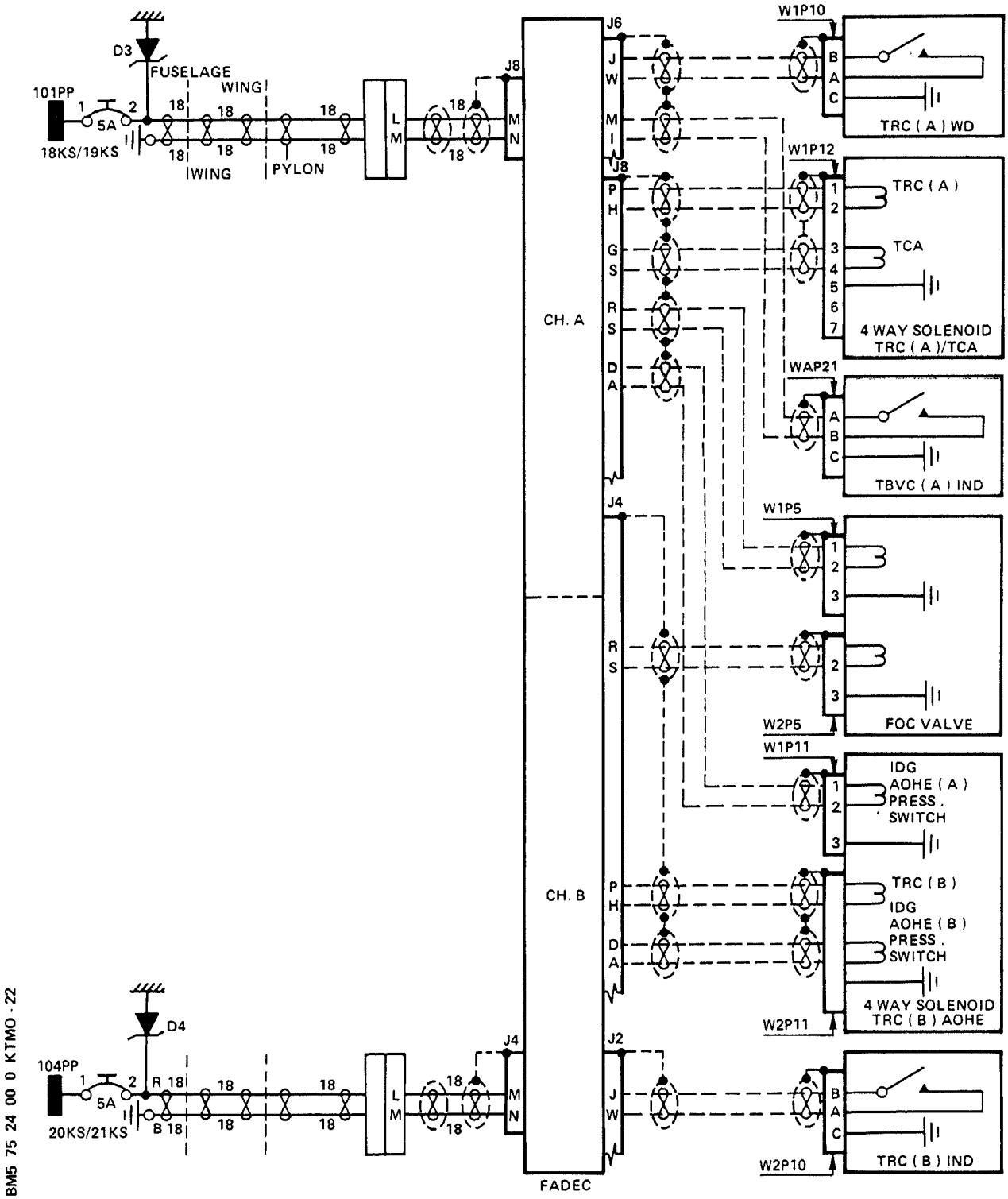
TCA Valves and Solenoid (Right Side
for Phase III Engine Configuration)
Figure 013



Turbine Vane and Blade Cooling Air Valve Filter
(for Phase I Engine Configuration)
Figure 014

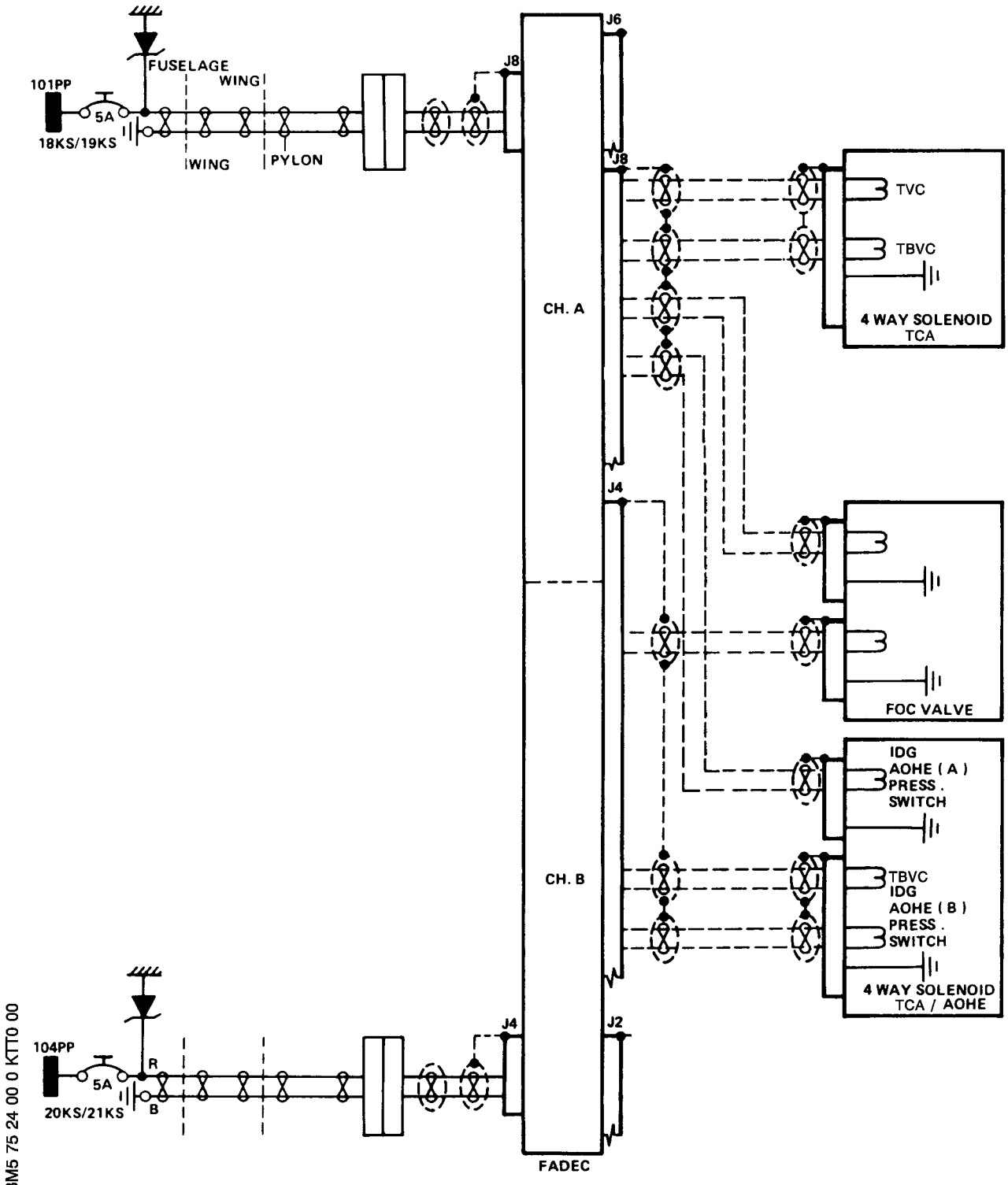


Turbine Vane and Blade Cooling Air Valve Filter
(for Phase III Engine Configuration)
Figure 015



BM5 75 24 00 0 KTMO 22

Performance Solenoids Power Supply
(for Phase I Engine Configuration)
Figure 016



Performance Solenoids Power Supply
(for Phase III Engine Configuration)
Figure 017

1. General

A. This procedure permits the removal of any one of the four turbine cooling air tubes (turbine vane cooling air ducts) which show cracks, and permits the installation of PWA85986 Blank Off Covers (No.1 and No.2) in their place for limited engine operation.

B. The engine can only be operated with one of the four turbine cooling air tubes (ducts) removed and blanked off at any one time.

C. For engines equipped with a borescope plug in the rear elbow of the lower left cooling air tube (duct), do not remove this tube and install blank off covers.

2. Equipment and Materials

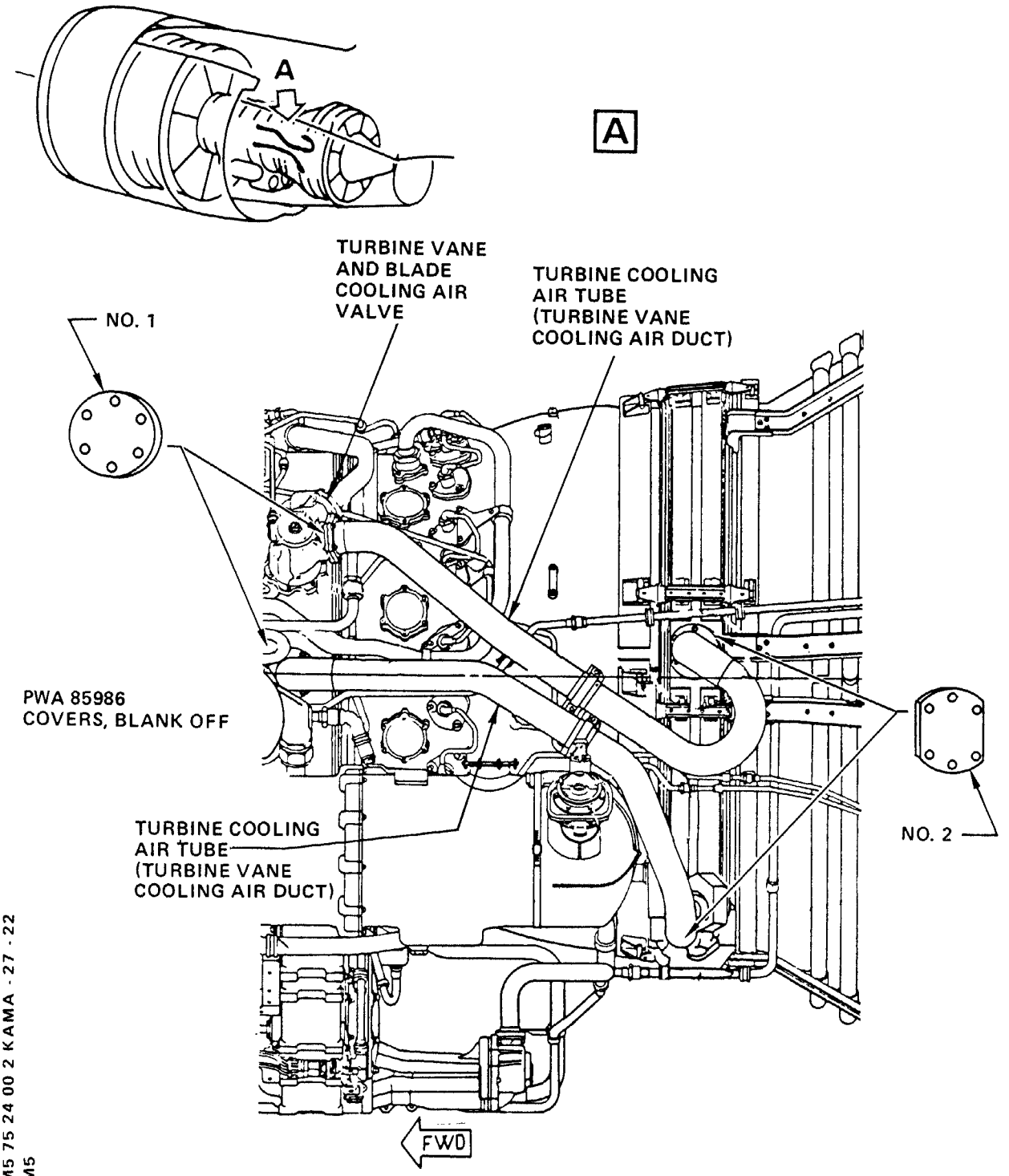
ITEM	DESIGNATION
A. PWA85986	Covers, Blank Off.
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-24-00, P. Block 601	Automatic Turbine Rotor Clearance Control (ATRCCS)
- 75-24-03, P. Block 401	Turbine Blade and Vane Air Ducts

3. Install Turbine Cooling System Blank off Covers

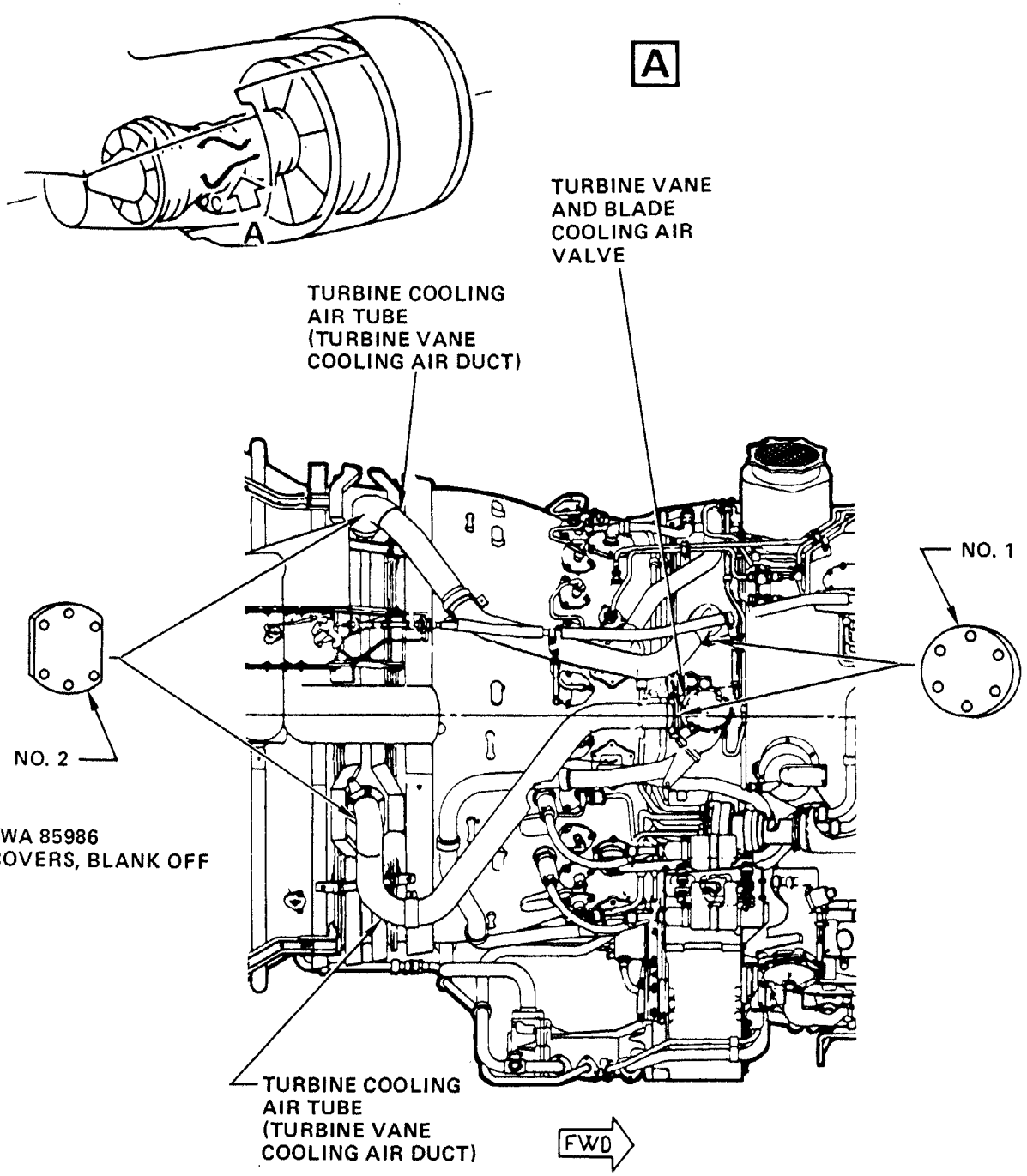
A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers, and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Inspect Turbine Air Cooling (TCA) system (Ref. 75-24-00, P. Block 601).

B. Procedure (Ref. Fig. 201)
(1)If a turbine cooling air tube is found to have a crack while the aircraft is away from a maintenance base, you are permitted to isolate the cooling air system as follows:
(a)Remove the cracked air tube (Ref. 75-24-03, P. Block 401).
(b)Install PWA85986 Blank Off Covers (No.1-Round Cover) to the valve or compressor case and (No.2-Slat Sided Cover) to the turbine case. The engine can be operated for a maximum of 50 hours or 5 cycles, or the lesser of the two numbers, with the covers installed.

C. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



Turbine Cooling Air Tubes (Turbine Vane Cooling Air Ducts) - (Sheet 1/2)
Figure 201



Turbine Cooling Air Tubes (Turbine Vane Cooling Air Ducts) - (Sheet 2/2)
Figure 201

TURBINE COOLING AIR SYSTEM - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clip
B.	Access Platform
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 75-24-00, P. Block 201	Automatic Turbine Rotor Clearance Control System (ATRCCS)
- 72-00-00, P. Block 601	Engine - General
- 75-24-03, P. Block 401	Turbine Blade and Vane Air Ducts

2. Inspect the Turbine Cooling Air (TCA) System

A. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Inspect Turbine Cooling Air (TCA) System Manifolds and Tubes (Ducts)
NOTE : This procedure provides inspection information and operating time limits for surface damage, cracked or severed turbine cooling air tubes (turbine vane cooling air ducts).
(1)Visually examine the turbine cooling air (TCA) system manifolds and tubes (ducts) (See Table 601).
NOTE : This inspection procedure does not require tube removal in order to inspect and verify acceptable tube condition. TCA system manifold and tube dents are to be considered acceptable for continued service if, visually, the tube OD is seen to not be decreased by more than 20 % at any particular location.
The following Inspection Reference Table 601 is intended to serve as an aid for identifying certain areas and conditions whenever maintenance time permits inspection. Manifold or tube inspection should not be accomplished solely on the basis of this table. Table 601 does not imply that items or conditions listed are all-inclusive. Experience and judgement will continue to be an important part of any inspection program.

ITEM	INSPECT FOR	CONTINUE IN SERVICE LIMITS
Turbine Cooling Air System Tubes	Cracks	None Permitted See following para.
	Corrosion and Stains	Permitted if it can be removed by light polishing with crocus cloth
	Loose Tube Nuts	None Permitted
	Loose or Broken Lockwire	None Permitted
	Nicks, Scratches, Chafing and Pitting	0.003 in. (0.076 mm) maximum depth permitted in all locations
	Dents (without sharp edges or corners)	Permitted if the tubing OD is not decreased by more than 20 % at each location. No dents permitted within 0.25 in. (6.35 mm) or less from the tube ferrule.
	Dents (with sharp edges or corners)	None Permitted

Inspection Reference Table.
Continue in Service Limits For the Turbine
Cooling Air System Tubes
Table 601

(2)The following action is to be taken if a cracked or severed turbine cooling air tube assembly is found.
(Ref. Fig. 601, 602).

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

(2)The following action is to be taken if a cracked or severed turbine cooling air tube assembly is found.
(Ref. Fig. 601, 603).

**ON A/C 101-200,

Limit/Specific Observation	Action Required
(a) A crack not exceeding 270 degrees in circumference of the tube or 6 inches (152.400 mm) length, no hole in the crack, and no record of high nacelle temperature or fire warnings on the previous flight.	Replace cracked tube prior to the next flight. (Ref. 75-24-03, P. Block 401) If a cracked tube assembly is found away from maintenance base, and a replacement part is not available, it is permissible to isolate broken tube system (Ref. 75-24-00, P. Block 201) and operate engine for a maximum of 50 hours or 5 cycles, whichever is less.
(b) A crack exceeding 270 degrees in circumference of the tube or more than 6 inches (152.400 mm) in length or hole in the crack, or a crack of any size accompanied by a high nacelle temperature or fire warning on the previous flight.	Remove the engine for HPT inspection immediately or if the cracked part is replaced, the engine may be operated for 50 hours or 5 cycles, whichever is less, to permit aircraft return to a maintenance base equipped for an engine change and HPT inspection. (Ref. 72-00-00, P. Block 601).

(3)Visually examine the turbine cooling air system tubes for 0.125 in. (3.175 mm) minimum clearance to adjacent tubes or structure.
(a)Minimum clearance between any two adjacent tubes or between one single tube and any other adjacent engine part shall be 0.125 in. (3.175 mm) unless otherwise specified. Exceptions to this clearance requirement are permitted at specific locations where adjacent tubes are clipped together or where other local constraints will prevent tube contact at clearances below 0.125 in. (3.175 mm) minimum.
(b)Minimum clearance refers only to clearance relative to tube and not to fittings or other attached hardware.
(4)Examine the tubes to make sure they are correctly attached at all support locations.
(a)Replace all worn clamps.
(b)Tighten all loose clamp bolts and brackets at all support points along the tube length.
(c)Tighten all loose tube fittings.
(5)Examine the turbine cooling air system tube connections, tube or

manifold to component connections, and tube to case boss connections for leaks and loose connections.
(a)No leaks or loose connections permitted.
(b)Make all corrections as necessary.

C. Inspect Valves and Solenoids
(1)Functional check
(a)Test reference Table (Ref. 71-00-00, P. Block 501).
(2)Physical inspection of supports/brackets.
(a)Looseness of supports/brackets attached to any valve/solenoid is not acceptable and must be corrected.
(3)Examine the valves solenoids for condition and serviceable installation (Ref. Fig. 604, 606).
(4)Examine the position indication pin on the turbine vane and blade cooling air valve (Ref. Fig. 606).

**ON A/C 101-105,

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(3)Examine the valves solenoids for condition and serviceable installation (Ref. Fig. 605, 607).
(4)Examine the position indication pin on the turbine vane and blade cooling air valve (Ref. Fig. 607).

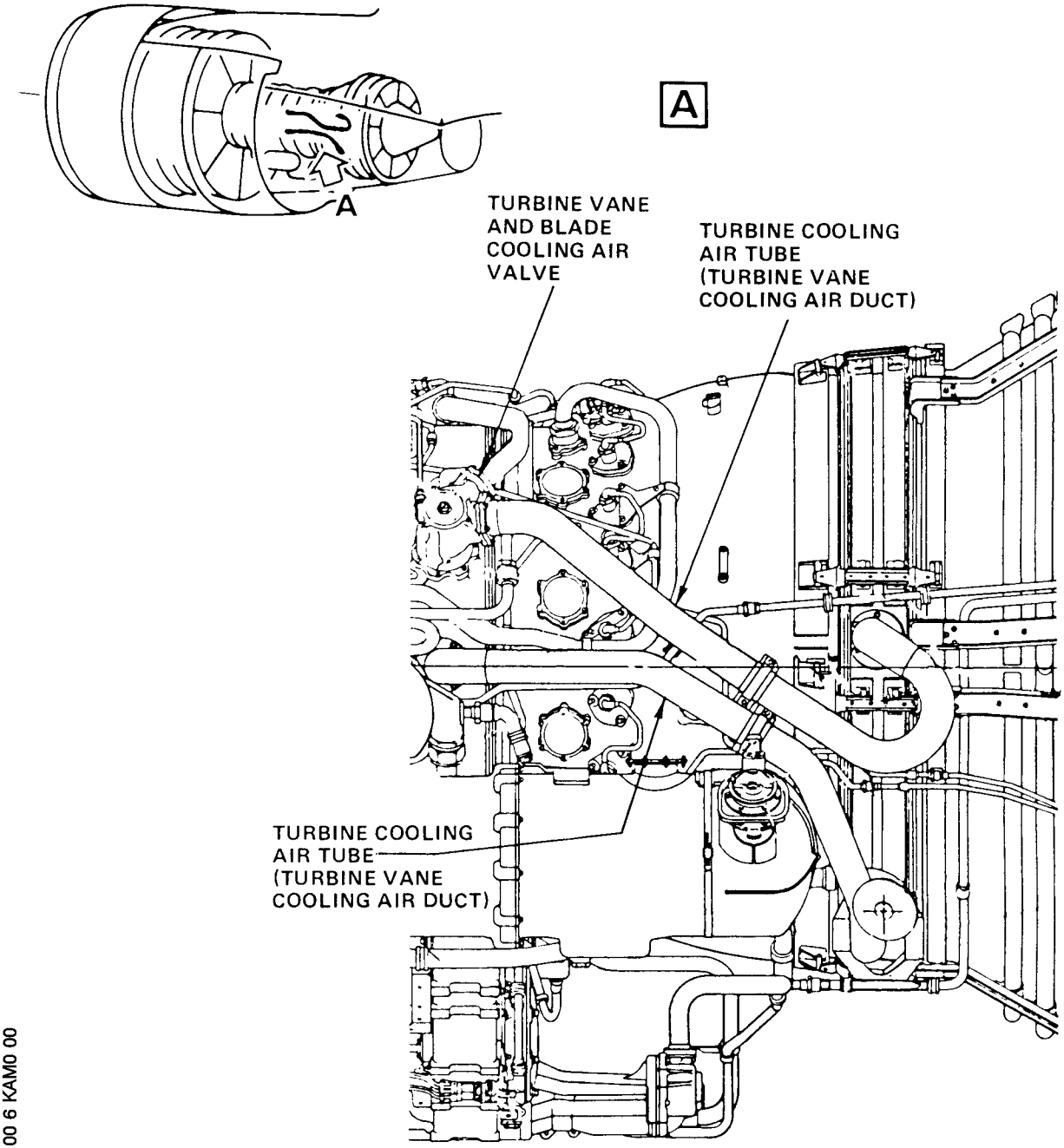
**ON A/C 101-200,

NOTE : Valves are spring loaded open when not in operation.
(a)An extended pin shows the valve is fully open (normal condition).
(b)If the pin is not fully extended, the valve is not fully open.
(c)Turbine vane and blade cooling air valve in the closed position (pin not extended).

	Limit/Specific Observation	Action Required
R	1 One valve stuck in the closed position.	Aircraft may be operated to the limits shown in the Master Minimum Equipment List (MMEL).
R	2 Two valves stuck in the closed position.	Aircraft may be operated to the limits shown in the Master Minimum Equipment List (MMEL).

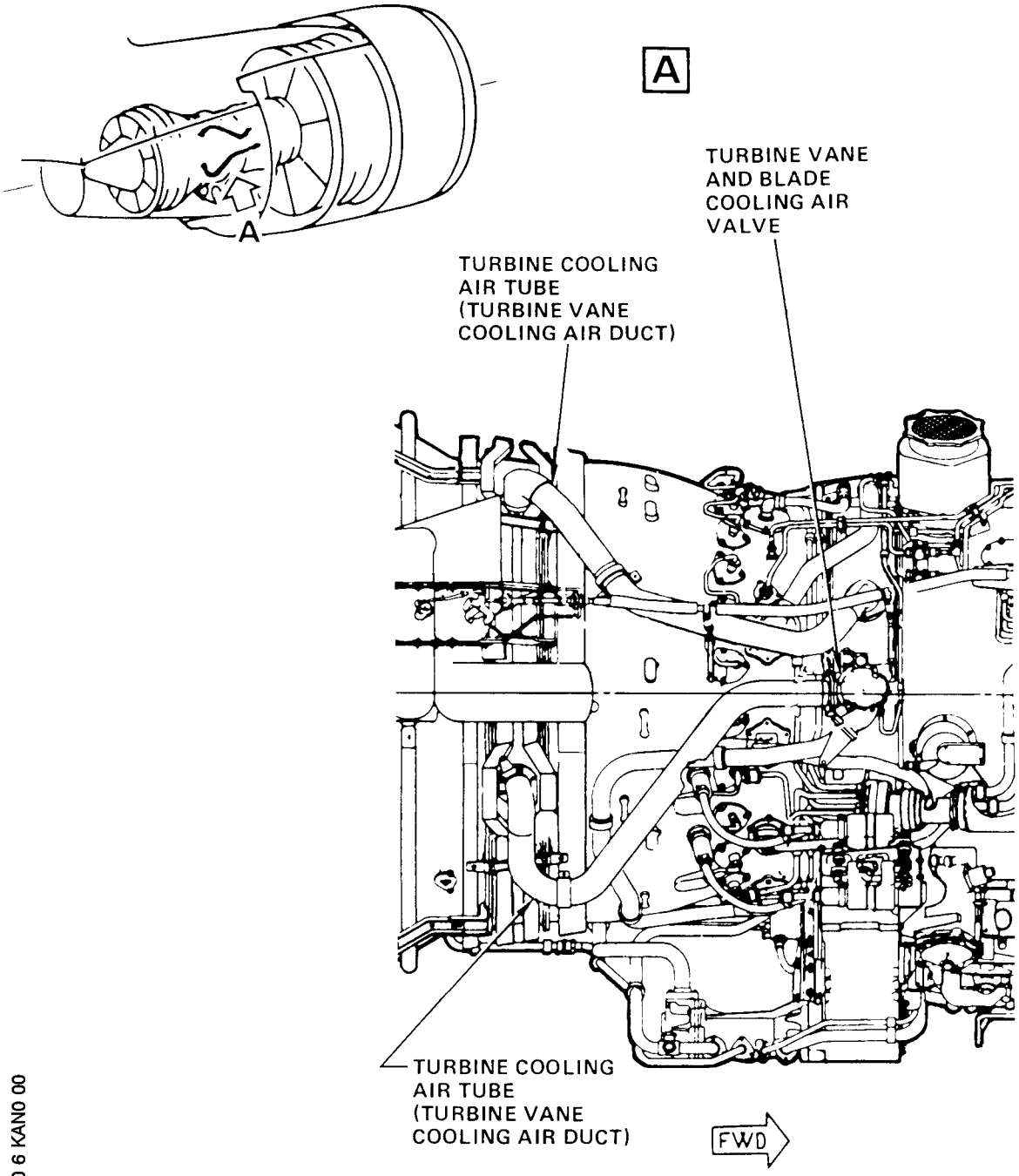
**ON A/C 101-200,

D. Close-Up
(1)Remove access platform.


A
A
TURBINE VANE AND BLADE COOLING AIR VALVE
TURBINE COOLING AIR TUBE (TURBINE VANE COOLING AIR DUCT)
TURBINE COOLING AIR TUBE (TURBINE VANE COOLING AIR DUCT)
L-A4671

BM5 75 24 00 6 KAM0 00

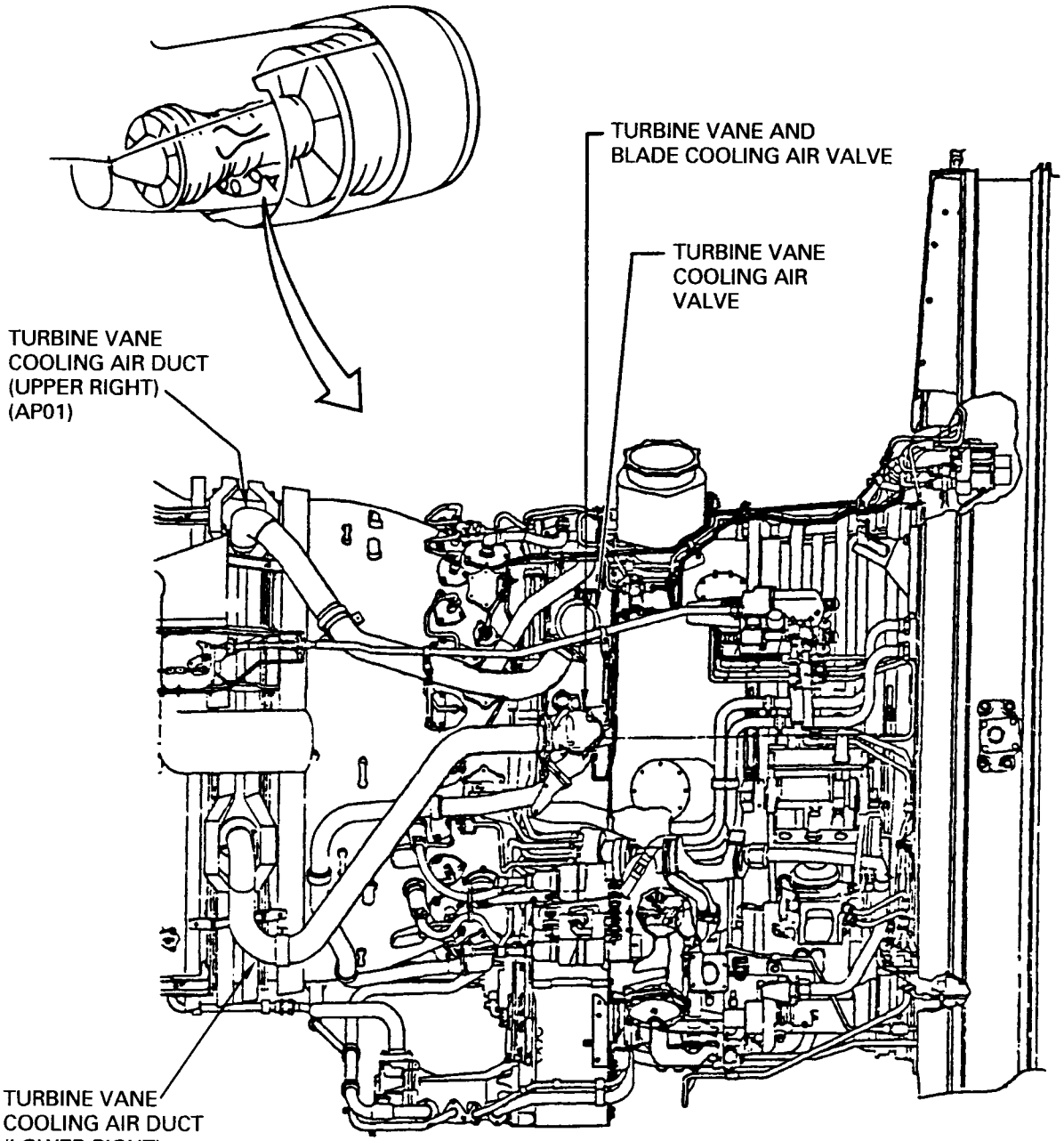
Turbine Case Cooling Air Tubes
(Turbine Vane Cooling Air Ducts)
Figure 601


A
A
TURBINE VANE AND BLADE COOLING AIR VALVE
TURBINE COOLING AIR TUBE (TURBINE VANE COOLING AIR DUCT)
TURBINE COOLING AIR TUBE (TURBINE VANE COOLING AIR DUCT)
FWD

BM5 75 24 00 6 KAN0 00

L-A4670

Turbine Case Cooling Air Tubes
(Turbine Vane Cooling Air Ducts)
Figure 602



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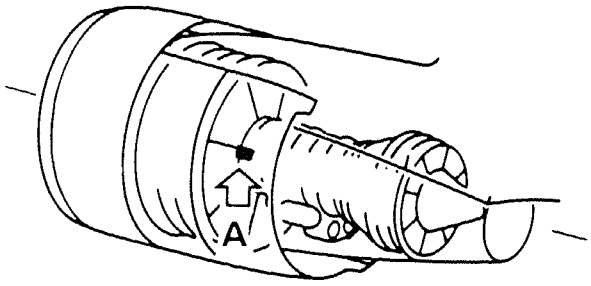
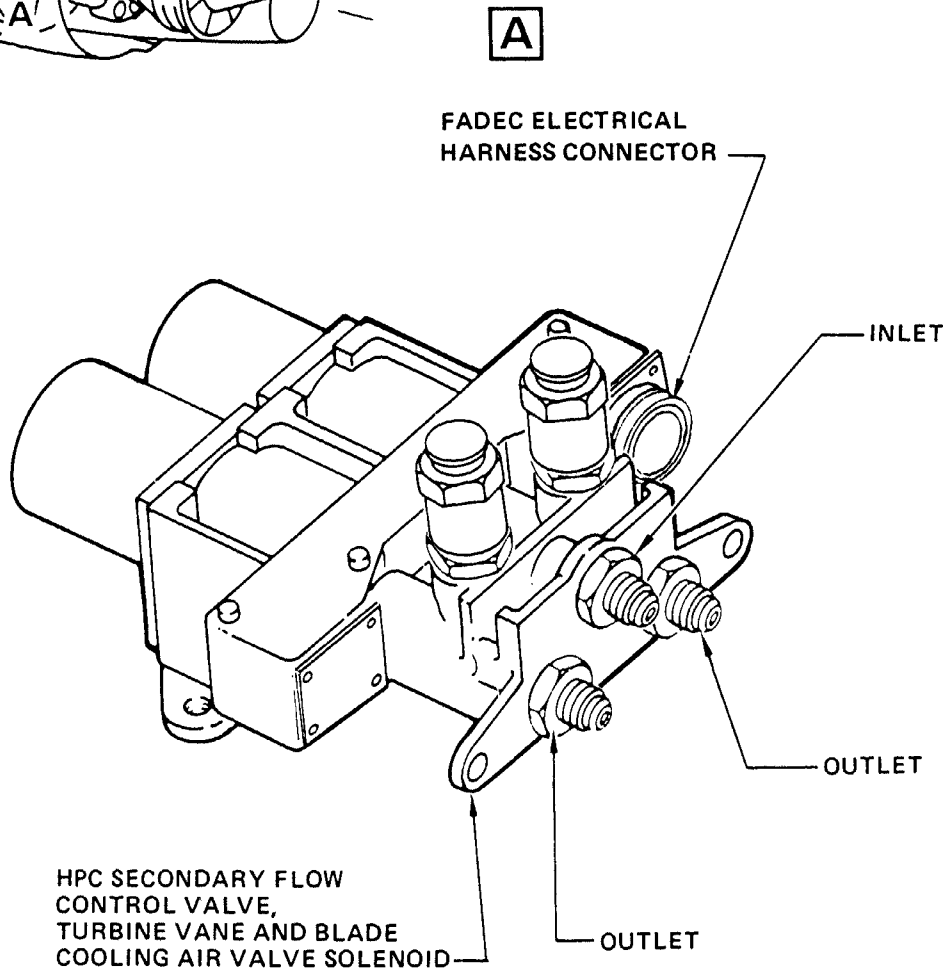
L-A9856 (0000)

Turbine Case Cooling Air Tubes
(Turbine Vane Cooling Air Ducts)
Figure 603





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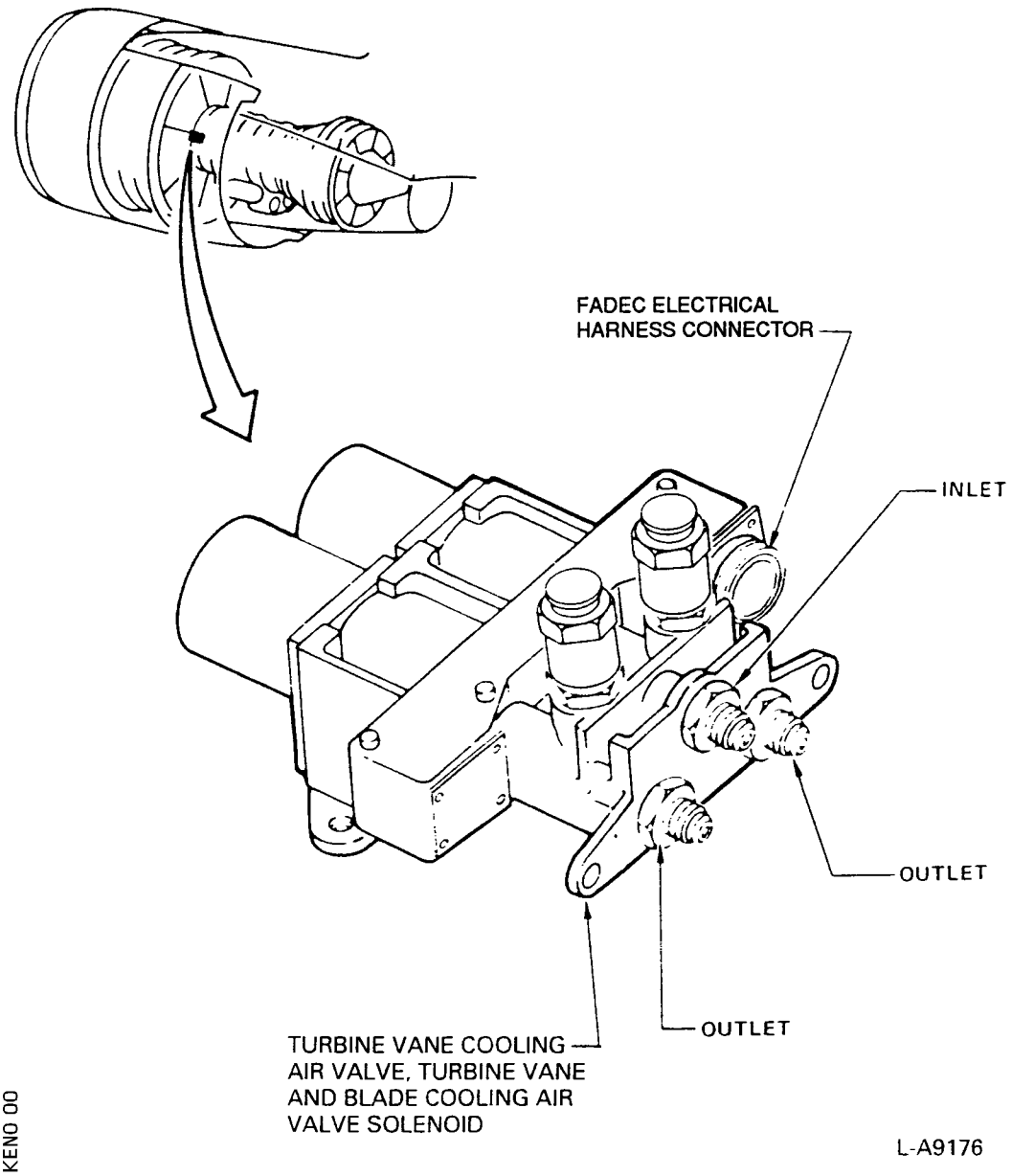
DM5

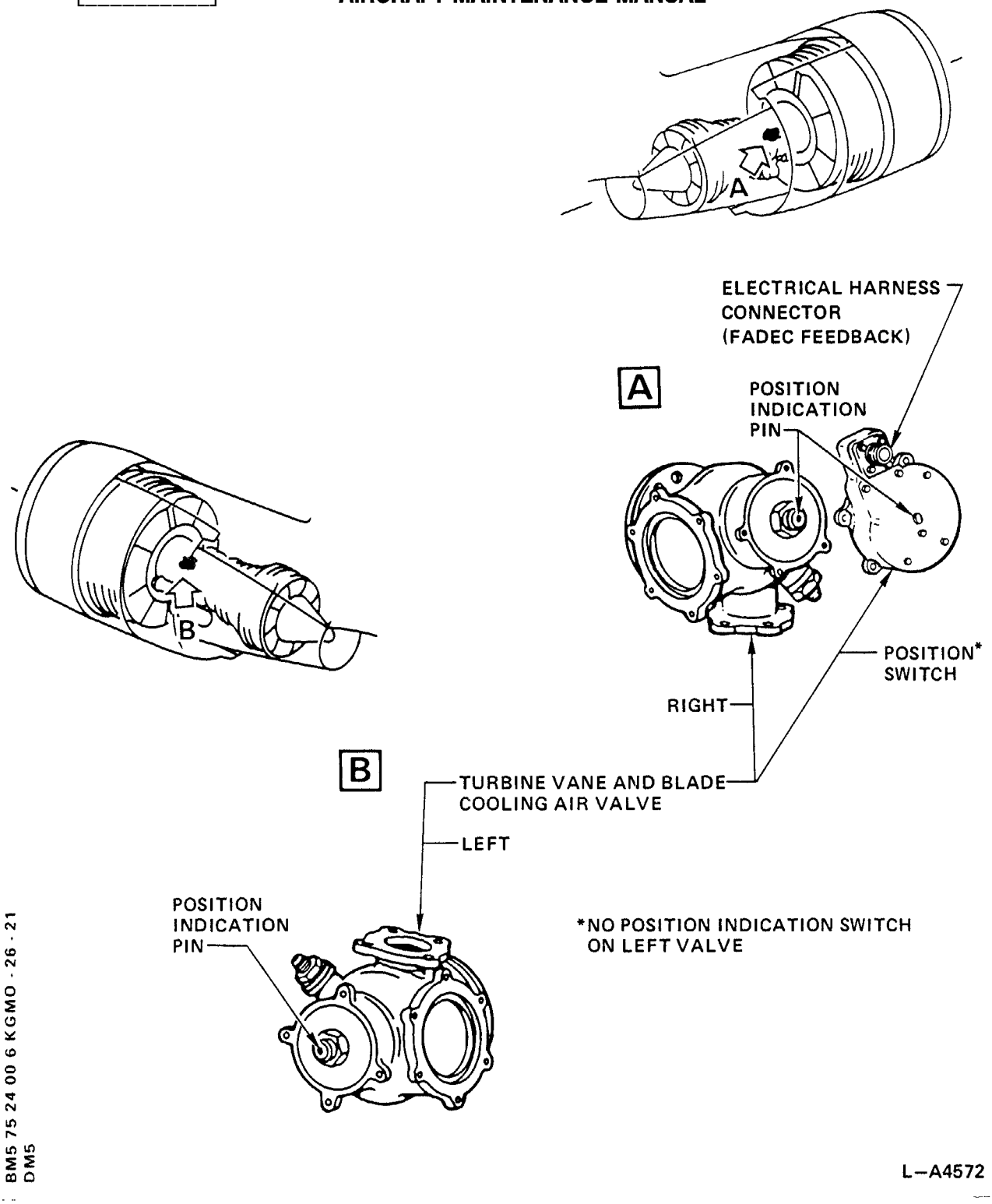
L—A3666
0688

HPC Secondary Flow Control Valve Turbine
Vane and Blade Cooling Air Valve Solenoid
Figure 604

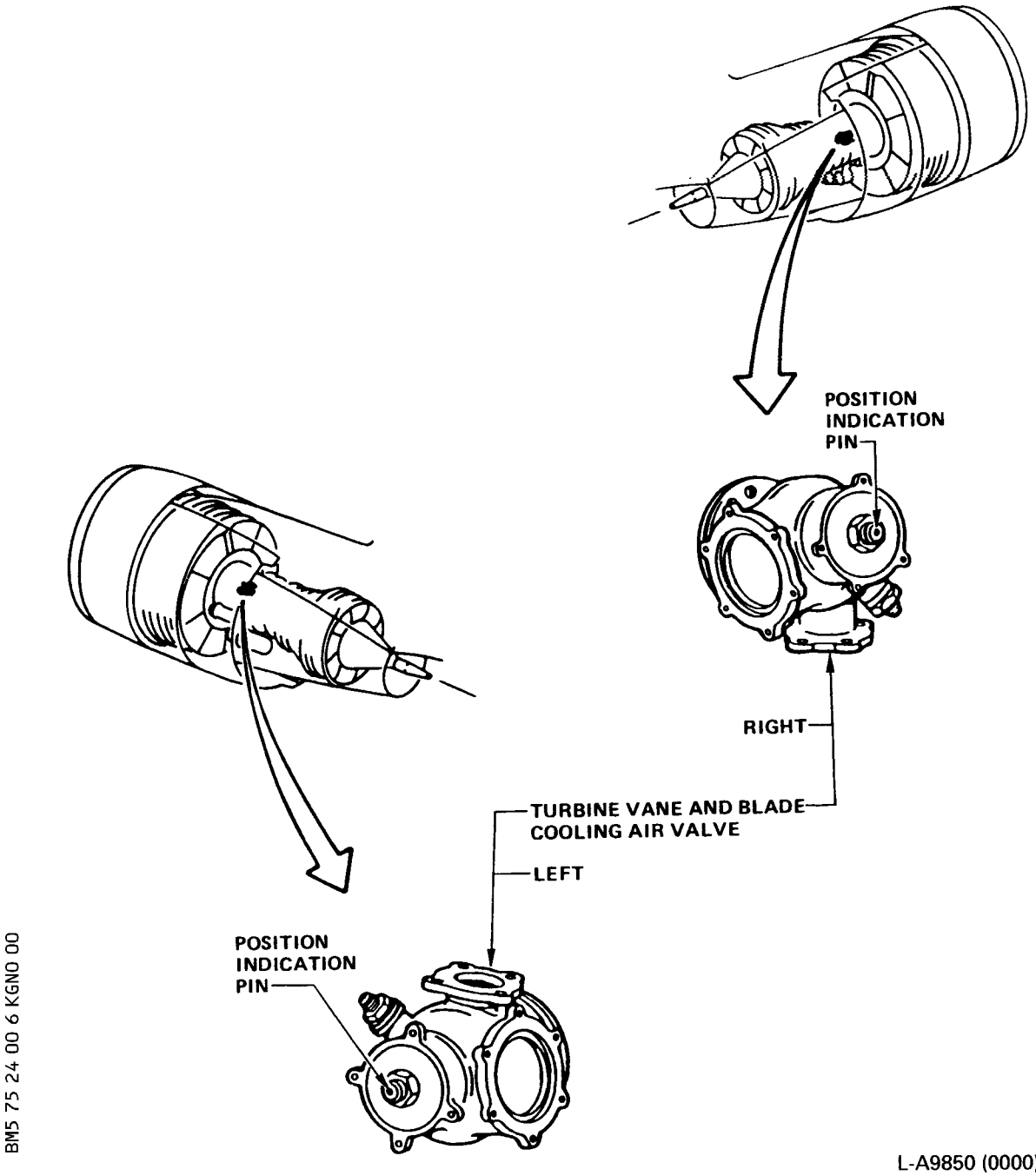


BM5 75 24 00 6 KENO 00

HPC Secondary Flow Control Valve Turbine
Vane and Blade Cooling Air Valve Solenoid
Figure 605



Turbine Vane and Blade Cooling Air Valve
Figure 606



BM5 75 24 00 6 KGNO 00

Turbine Vane and Blade Cooling Air Valve
Figure 607

(2)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

TURBINE VANE AND BLADE COOLING AIR VALVES - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Gaskets
D.	Protective Closures
E.	Torque Wrench
F.	Torque Adapter (5/16 in., 12 point, 2 9/16 in. (65.088 mm) length))
G.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
H. Material No.P03-001	Oils (Ref. 70-00-00)
J. Material No.P05-059	Special Materials (Ref. 70-00-00)
K. Material No.P05-289	Special Materials (Ref. 70-00-00)
L. Material No.P05-291	Special Materials (Ref. 70-00-00) (Optional)
M. Material No.P05-292	Special Materials (Ref. 70-00-00) (Optional)
R N. Material No.P06-013	Lubricants (Ref. 70-00-00)
R P. Material No.P06-021	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 75-24-13, P. Block 401	Turbine Vane and Blade Cooling Air Valve Position Switch

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

TURBINE VANE AND BLADE COOLING AIR VALVES - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Gaskets
D.	Protective Closures
E.	Torque Wrench
F.	Torque Adapter (5/16 in., 12 point, 2 9/16 in. (65.088 mm) length))
G.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
H. Material No.P03-001	Oils (Ref. 70-00-00)
J. Material No.P05-059	Special Materials (Ref. 70-00-00)

ITEM	DESIGNATION
K. Material No.P05-289	Special Materials (Ref. 70-00-00)
L. Material No.P05-291	Special Materials (Ref. 70-00-00) (Optional)
M. Material No.P05-292	Special Materials (Ref. 70-00-00) (Optional)
R N. Material No.P06-013	Lubricants (Ref. 70-00-00)
R P. Material No.P06-021	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

**ON A/C 101-200,

2. Right Turbine Vane and Blade Cooling Air Valves (for PHASE I Configuration Engines)

NOTE : This procedure is only available on aircraft equipped with PHASE I configured engines.

A. Job Set-Up

(1)Open, safety and tag the circuit breakers for the appropriate engine.
(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(3)Install access platform.
(4)Remove turbine vane and blade cooling air valve position switch (Ref. 75-24-13, P. Block 401).

B. Removal (Ref. Fig. 401)

Pre SB PW4ENG 75-116

(1)Remove lockwire. Disconnect tube nut securing air signal tube (AA21) to valve.

Post SB PW4ENG 75-116

(2)Remove lockwire. Disconnect tube nut securing air signal tube (AA90) to valve.

End SB PW4ENG 75-116

(3)Loosen and remove bolts securing, rear flange of valve to forward flange of turbine vane cooling air duct assembly.
(4)Remove bolts securing bracket and turbine blade cooling air tube assembly (AP37) front flange to valve.
(5)Remove bolt and nut securing tube to bracket mounted to valve flange.
(6)Remove bolt and nut securing adjustable link to same bracket.
(7)Remove bolts securing valve flange and bracket to engine boss.

NOTE : The use of a standard torque adapter will make the valve removal easier.

(8)Remove turbine vane and blade cooling air valve (right) from engine.

Pre SB PW4ENG 72-572 or Pre SB PW4ENG 72-537 or Post SB PW4ENG 72-627

(a)Remove and discard the gaskets. Remove the metering plate from the four hole flange of tube assembly (AP37) and install the

protective closures.

Post SB PW4ENG 72-572 and Pre SB PW4ENG 72-627 or
Post SB PW4ENG 72-537 and Pre SB PW4ENG 72-627

(b)Remove and discard the gaskets. Remove the ring spacer from the four hole flange of tube assembly (AP37) and install the protective closures.

End All SBs

(c)If valve is to be replaced, remove tube adapter and gasket from valve.

(9)Install protective closures to open tubes and valve pad.

C. Installation (Ref. Fig. 401)

(1)Remove protective closures.

(2)If new valve is being installed, comply with the following :

NOTE : If the engine has the ring case style compressor, (Post SB PW4ENG 72-756), you must install a turbine vane and blade cooling air valve (Post PW4ENG 75-147) with the foolproofing pin hole to match the pin on the flange boss.

(a)Install gasket to tube adapter.

(b)Lubricate adapter threads with Engine Oil (Material No.P03-001), and install adapter in air supply (servo) port of valve.

(c)Tighten and TORQUE adapter to between 110 and 120 lbf.in. (1.24 and 1.36 m.daN).

(3)Install new metal gasket to boss on HPC case located on right side of engine at 3 o'clock position forward of Flange K and secure with Paraffin Wax (Material No.P05-059).

CAUTION : WITH A STANDARD TORQUE ADAPTER, ADJUST THE ACTUAL TORQUE WRENCH READING (REF. 70-00-00, P. BLOCK 201). TOO MUCH TORQUE CAN DAMAGE THE THREADED PARTS.

(4)Position valve and bracket to boss and secure with bolts, threads lubricated with Engine Oil (Material No.P03-001). Use a standard torque adapter to tighten and TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Then without loosening, continue to tighten to same torque until torque is maintained.

(5)Install bolt, threads lubricated with Engine Oil (Material No.P03-001), nut, and link rod end to bracket mounted to valve flange. TORQUE bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(6)Install bolts, threads lubricated with Engine Oil (Material No.P03-001) and nuts securing tube clamps to same bracket. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(7)Position new metal gasket between flange of valve and turbine vane cooling air duct and secure flanges with bolts, threads lubricated with Engine Oil (Material No.P03-001). Tighten and TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to required torque until torque is kept.

Pre SB PW4ENG 72-504 or Pre SB PW4ENG 72-537 or Post SB PW4ENG 72-627

(8)Install the gasket and metering plate in the four hole flanged end of the turbine blade cooling air tube (AP37) and hold in place with Paraffin Wax (Material No.P05-059). Install a second gasket to mating flange on valve and hold in place with Paraffin Wax (Material No.P05-059). Attach flange of tube to valve with bolts, threads

lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to same torque until torque is kept.

Post SB PW4ENG 72-504 and Pre SB PW4ENG 72-627 or
Post SB PW4ENG 72-537 and Pre SB PW4ENG 72-627

(9)Install the gasket and ring spacer in the four hole flanged end of the turbine blade cooling air tube (AP37) and hold in place with Paraffin Wax (Material No.P05-059). Install a second gasket to mating flange on valve and hold in place with Paraffin Wax (Material No.P05-059).
Attach flange of tube to valve with bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to same torque until torque is kept.

End All SBs

Pre SB PW4ENG 75-116

(10)Lubricate threads of tube adapter with Antigalling Compound (Material No.P06-021), and secure air signal tube (AA21) to adapter. Tighten and TORQUE tube nut to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the nut.

Post SB PW4ENG 75-116

(11)Lubricate threads of tube adapter with Antigalling Compound (Material No.P06-021), and secure air signal tube (AA90) to adapter. Tighten and TORQUE tube nut to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the nut.

End SB PW4ENG 75-116

D. Close-Up and Test

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Install turbine vane and blade cooling air valve position switch (Ref. 75-24-13, P. Block 401).
(3)Remove access platform.
(4)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(5)Remove safety clips and tags and close circuit breakers.
(6)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

2. Right Turbine Vane and Blade Cooling Air Valves (for PHASE III Configuration Engines)

NOTE : This procedure is only available on aircraft equipped with PHASE III configured engines.

A. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine.
(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(3)Install access platform.

B. Removal (Ref. Fig. 402)
(1)Remove lockwire. Disconnect tube nut securing air signal tube (AA77) to valve.
(2)Loosen and remove bolts securing, rear flange of valve to forward flange of turbine vane cooling air duct assembly.
(3)Remove bolts securing bracket and turbine blade cooling air tube assembly (AP37) front flange to valve.
(4)Remove bolt and nut securing tube to bracket mounted to valve flange.
(5)Remove bolt and nut securing adjustable link to same bracket.
(6)Remove bolts securing valve flange and bracket to engine boss.
NOTE : The use of a standard torque adapter will make the valve removal easier.
(7)Remove turbine vane and blade cooling air valve (right) from engine.
Pre SB PW4ENG 72-537 or Post SB PW4ENG 72-627
(a)Remove and discard the gaskets. Remove the metering plate from the four hole flange of tube assembly (AP37) and install the protective closures.
Post SB PW4ENG 72-537 and Pre SB PW4ENG 72-627
(b)Remove and discard the gaskets. Remove the ring spacer from the four hole flange of tube assembly (AP37) and install the protective closures.
End All SBs
(c)If valve is to be replaced, remove tube adapter and gasket from valve.
(8)Install protective closures to open tubes and valve pad.

C. Installation (Ref. Fig. 402)
(1)Remove protective closures.
(2)If new valve is being installed, comply with the following :
NOTE : If the engine has the ring case style compressor, (Post SB PW4ENG 72-756), you must install a turbine vane and blade cooling air valve (Post PW4ENG 75-147) with the foolproofing pin hole to match the pin on the flange boss.
(a)Install gasket to tube adapter.
(b)Lubricate adapter threads with Engine Oil (Material No.P03-001), and install adapter in air supply (servo) port of valve.
(c)Tighten and TORQUE adapter to between 110 and 120 lbf.in. (1.24 and 1.36 m.daN).
(3)Install new metal gasket to boss on HPC case located on right side of engine at 3 o'clock position forward of Flange K and secure with Paraffin Wax (Material No.P05-059).
CAUTION : WITH A STANDARD TORQUE ADAPTER, ADJUST THE ACTUAL TORQUE WRENCH READING (REF. 70-00-00, P. BLOCK 201). TOO MUCH TORQUE CAN DAMAGE THE THREADED PARTS.
(4)Position valve and bracket to boss and secure with bolts, threads lubricated with Engine Oil (Material No.P03-001). Use a standard torque

adapter to tighten and TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Then without loosening, continue to tighten to same torque until torque is maintained.

(5)Install bolt, threads lubricated with Engine Oil (Material No.P03-001), nut, and link rod end to bracket mounted to valve flange. TORQUE bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(6)Install bolt, threads lubricated with Engine Oil (Material No.P03-001) and nut securing tube clamp to same bracket. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(7)Position new metal gasket between flange of valve and turbine vane cooling air duct and secure flanges with bolts, threads lubricated with Engine Oil (Material No.P03-001). Tighten and TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to required torque until torque is kept.

Pre SB PW4ENG 72-537 and Post SB PW4ENG 72-627

(8)Install gasket to flange of turbine blade cooling air tube (AP37) and a second gasket to mating flange on valve and hold in place with Paraffin Wax (Material No.P05-059). Install metering plate between gaskets and secure flange of tube to valve with bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to same torque until torque is kept.

Post SB PW4ENG 72-537 and Pre SB PW4ENG 72-627

(9)Install gasket to flange of turbine blade cooling air tube (AP37) and a second gasket to mating flange on valve and hold in place with Paraffin Wax (Material No.P05-059). Install ring spacer between gaskets and secure flange of tube to valve with bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to same torque until torque is kept.

End All SBs

(10)Lubricate threads of the tube adapter with Antigalling Compound (Material No.P06-021), and secure air signal tube (AA77) to adapter. Tighten and TORQUE tube nut to between 200 and 225 lbf.in. (22.6 and 25.4 m.daN). Install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the nut.

D. Close-Up and Test

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Remove access platform.

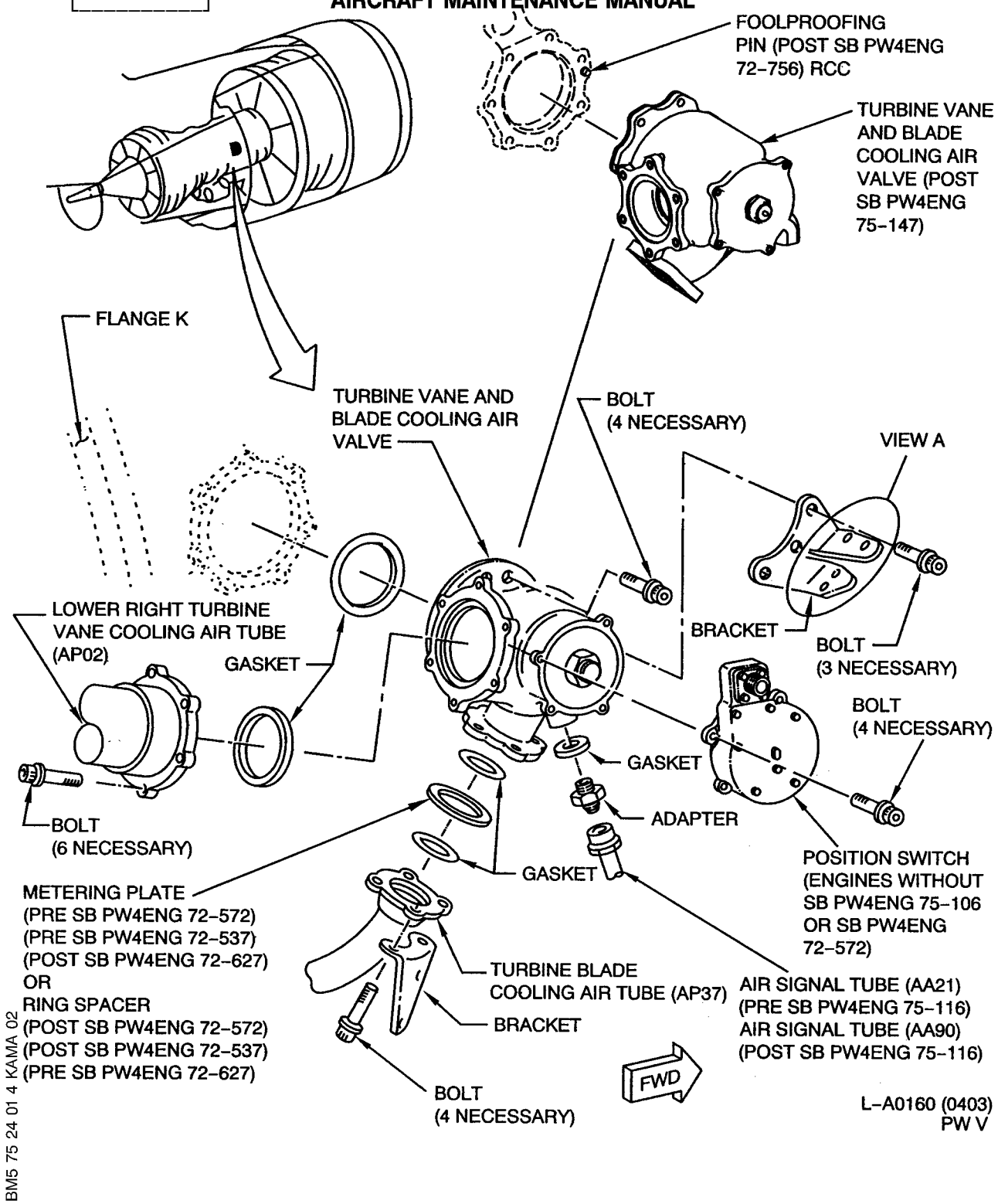
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(4)Remove safety clips and tags and close circuit breakers.

(5)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

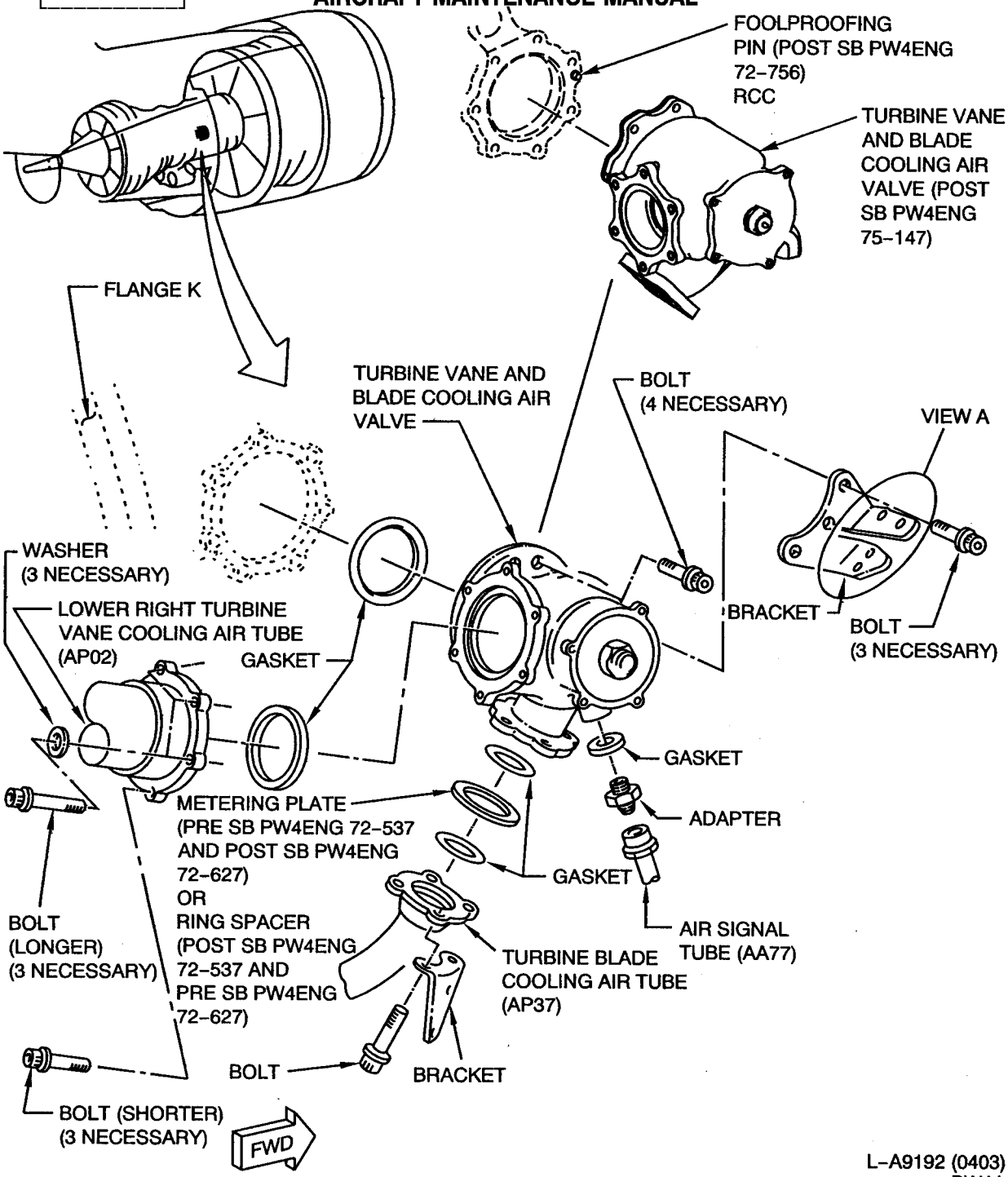
**ON A/C 101-200,

3. Left Turbine Vane and Blade Cooling Air Valves (for PHASE I Configuration Engines)


FOOLPROOFING PIN (POST SB PW4ENG 72-756) RCC
TURBINE VANE AND BLADE COOLING AIR VALVE (POST SB PW4ENG 75-147)
FLANGE K
TURBINE VANE AND BLADE COOLING AIR VALVE
BOLT (4 NECESSARY)
VIEW A
LOWER RIGHT TURBINE VANE COOLING AIR TUBE (AP02)
GASKET
BRACKET
BOLT (3 NECESSARY)
BOLT (4 NECESSARY)
GASKET
ADAPTER
BOLT (6 NECESSARY)
POSITION SWITCH (ENGINES WITHOUT SB PW4ENG 75-106 OR SB PW4ENG 72-572)
GASKET
METERING PLATE (PRE SB PW4ENG 72-572) (PRE SB PW4ENG 72-537) (POST SB PW4ENG 72-627) OR RING SPACER (POST SB PW4ENG 72-572) (POST SB PW4ENG 72-537) (PRE SB PW4ENG 72-627)
TURBINE BLADE COOLING AIR TUBE (AP37)
AIR SIGNAL TUBE (AA21) (PRE SB PW4ENG 75-116) AIR SIGNAL TUBE (AA90) (POST SB PW4ENG 75-116)
BRACKET
BOLT (4 NECESSARY)
FWD
L-A0160 (0403)
PW V

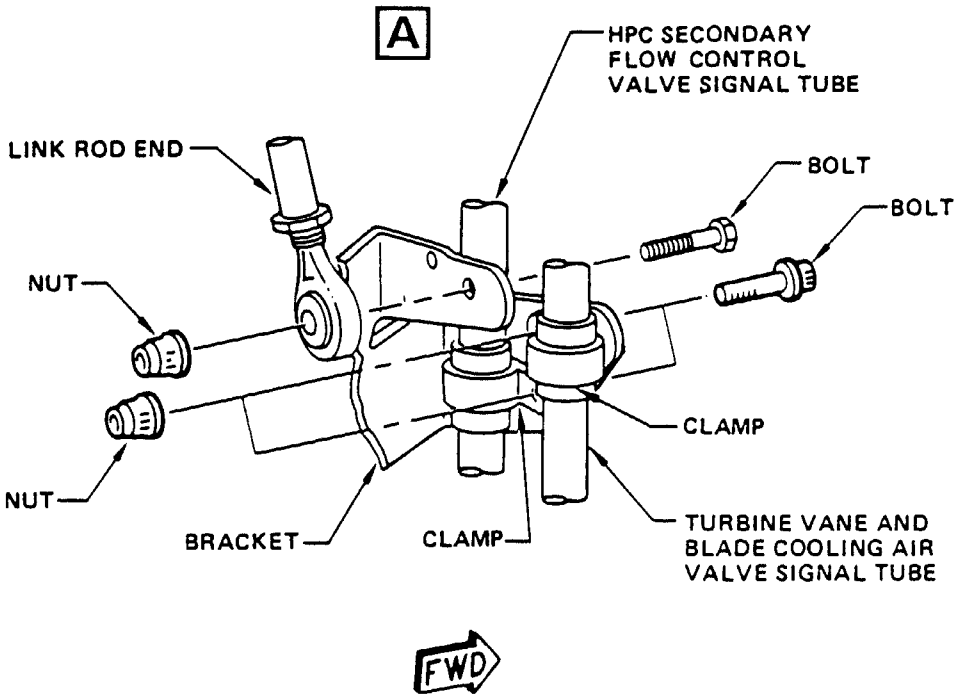
BM5 75 24 01 4 KAMA 02

Turbine Vane and Blade Cooling Air Valve (Right)
PHASE I Configuration - Sheet 1/2
Figure 401


FOOLPROOFING PIN (POST SB PW4ENG 72-756) RCC
TURBINE VANE AND BLADE COOLING AIR VALVE (POST SB PW4ENG 75-147)
FLANGE K
TURBINE VANE AND BLADE COOLING AIR VALVE
BOLT (4 NECESSARY)
VIEW A
WASHER (3 NECESSARY)
LOWER RIGHT TURBINE VANE COOLING AIR TUBE (AP02)
GASKET
BRACKET
BOLT (3 NECESSARY)
GASKET
METERING PLATE (PRE SB PW4ENG 72-537 AND POST SB PW4ENG 72-627) OR RING SPACER (POST SB PW4ENG 72-537 AND PRE SB PW4ENG 72-627)
ADAPTER
GASKET
BOLT (LONGER) (3 NECESSARY)
AIR SIGNAL TUBE (AA77)
TURBINE BLADE COOLING AIR TUBE (AP37)
BOLT
BRACKET
BOLT (SHORTER) (3 NECESSARY)
FWD
L-A9192 (0403)
PW V

BM5 75 24 01 4 KATA 03

Turbine Vane and Blade Cooling Air Valve (Right)
(PHASE III Configuration) - Sheet 1/2
Figure 402



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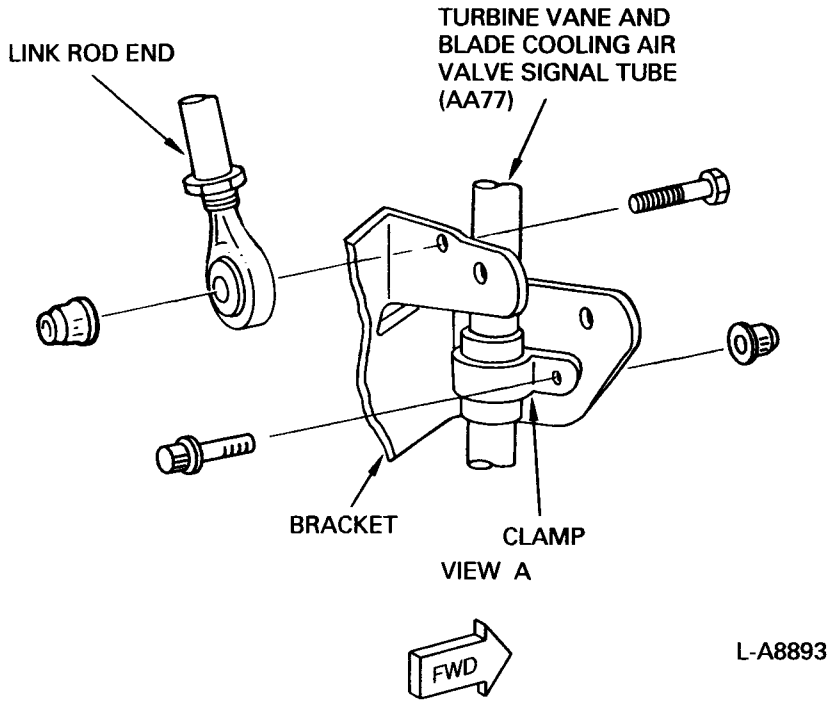
L – A2453

Turbine Vane and Blade Cooling Air Valve (Right)
PHASE I Configuration - Sheet 2/2
Figure 401



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Turbine Vane and Blade Cooling Air Valve (Right)
(PHASE III Configuration) - Sheet 2/2
Figure 402

NOTE : This procedure is only available on aircraft equipped with PHASE I configured engines.

A. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine.
(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(3)Install access platform
(4)Remove upper-left-forward starter duct segment.

B. Removal (Ref. Fig. 403)
(1)Remove lockwire and disconnect air signal tube (AA19) from valve.
(2)Loosen and remove bolts securing rear flange of valve to forward flange of turbine vane cooling air duct assembly (AP04).
(3)Remove bolts securing turbine blade cooling air tube assembly (AP38) front flange to valve.

Pre SB PW4ENG 72-572 or Pre SB PW4ENG 72-537 or Post SB PW4ENG 72-627

(a)Remove and discard the gaskets. Remove the metering plate and install the protective closures.

Post SB PW4ENG 72-572 and Pre SB PW4ENG 72-627 or Post SB PW4ENG 72-537 and Pre SB PW4ENG 72-627

(b)Remove and discard the gaskets. Remove the ring spacer and install the protective closures.

End All SBs

(4)Remove bolt and nut securing tube clamp to bracket attached to valve flange.
(5)Remove bolts securing valve flange to engine pad.
NOTE : The use of a standard torque adapter will make the valve removal easier.
(6)Remove bracket and turbine vane and blade cooling air valve (left) from engine.
Discard metal gasket. Install protective closures to open tubes, duct and valve pad.
(a)If valve is to be replaced, remove tube adapter and gasket from valve. Install protective closure.

C. Installation (Ref. Fig. 403)
(1)Remove protective closures.
(2)If new valve is being installed, comply with the following :
NOTE : If the engine has the ring case style compressor, (Post SB PW4ENG 72-756), you must install a turbine vane and blade cooling air valve (Post PW4ENG 75-147) with the foolproofing pin hole to match the pin on the flange boss.
(a)With gasket on tube adapter and with threads lubricated with Engine Oil (Material No.P03-001), install to air supply (servo) port of valve.
(b)Tighten and TORQUE adapter to between 110 and 120 lbf.in. (1.24 and 1.36 m.daN).
(3)Install new metal gasket to pad on HPC case located in upper left side of engine at 10 o'clock position forward of Flange K and secure with Paraffin Wax (Material No.P05-059).
CAUTION : WITH A STANDARD TORQUE ADAPTER, ADJUST THE ACTUAL TORQUE WRENCH

READING (REF. 70-00-00, P. BLOCK 201). TOO MUCH TORQUE CAN DAMAGE THE THREADED PARTS.

(4)Position valve and bracket to above pad and secure with bolts, threads lubricated with Engine Oil (Material No.P03-001). Use a standard torque adapter to tighten and TORQUE bolts between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Then without loosening, continue to tighten to same torque until torque is maintained.

(5)Install bolt, threads lubricated with Engine Oil (Material No.P03-001), and nut securing tube clamp to bracket mounted on flange of valve. TORQUE bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(6)Position new metal gasket between flanges of subject valve and turbine vane cooling air duct (AP04) and secure flanges with bolts, threads lubricated with Engine Oil (Material No.P03-001). Tighten and TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Then without loosening, continue to tighten to same torque until torque is maintained.

Pre SB PW4ENG 72-572 or Pre SB PW4ENG 72-537 or Post SB PW4ENG 72-627

(7)Install the gasket to the four hole flanged end of the blade cooling air tube (AP38) and a second gasket to the mating flange of the valve and hold in place with Paraffin Wax (Material No.P05-059). Install the metering plate between the gaskets and attach the flange of the tube to the valve with bolts, threads lubricated with Engine Oil (Material No.P03-001).
TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to the same torque until the torque is maintained.

Post SB PW4ENG 72-572 and Pre SB PW4ENG 72-627 or
Post SB PW4ENG 72-537 and Pre SB PW4ENG 72-627

(8)Install the gasket to the four hole flanged end of the blade cooling air tube (AP38) and a second gasket to the mating flange of the valve and hold in place with Paraffin Wax (Material No.P05-059). Install the ring spacer between the gaskets and attach the flange of the tube to the valve with bolts, threads lubricated with Engine Oil (Material No.P03-001).
TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to the same torque until the torque is maintained.

End All SBs

(9)Lubricate threads on air signal tube (AA19) with Engine Oil (Material No.P03-001). Install air signal tube to valve, and TORQUE to between 270 and 300 lbf.in. (3.05 an 3.38 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.

(10)Install starter upper duct

(a)Lubricate inside surface of duct coupling with Solid Film Lubricant (Material No.P06-013).

(b)Position duct on regulated pressure elbow (4). Place coupling seal between mating flanges.

(c)Verify that outside diameters of mating flanges are aligned radially within 0.06 inch (1.524 mm), and angular gap between mating faces of flanges is not greater than 0.04 inch (1.016 mm).

(d)Attach duct to regulated pressure elbow with coupling and seal. Tighten coupling fingertight.

(e)Lubricate inside surface of duct coupling with Solid Film Lubricant (Material No.P06-013).
(f)Position duct on starter intermediate duct. Place coupling seal between mating flanges.
(g)Verify that outside diameters of mating flanges are aligned radially within 0.06 inch (1.524 mm), and angular gap between mating faces of flanges is not greater than 0.04 inch (1.016 mm).
(h)Attach duct to starter intermediate duct with coupling and seal. Tighten coupling fingertight.
(i)Attach small tube support clamps to upper surface of duct, two places.
1 Secure high pressure bleed valve to pylon tube assembly to inner leg of forward and rearward supports on upper duct with clamps, washers and bolts. TORQUE bolts to between 20 and 25 lbf. in. (0.23 and 0.28 m.daN).
2 Secure bleed duct to precooler valve tube assembly and high pressure bleed valve to pylon tube assembly to outer leg of forward and rearward supports on upper duct with clamps, washers, and bolts. TORQUE bolts to between 20 and 25 lbf. in. (0.23 and 0.28 m.daN).
(j)TORQUE couplings to value marked on each coupling. Tap coupling lightly with a fiber hammer, then recheck torque.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

3. Left Turbine Vane and Blade Cooling Air Valves (for PHASE III Configuration Engines)

NOTE : This procedure is only available on aircraft equipped with PHASE III configured engines.

A. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine.
(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(3)Install access platform.
(4)Remove upper-left-forward starter duct segment.

B. Removal (Ref. Fig. 404)
(1)Remove lockwire and disconnect air signal tube (AA19) from valve.
(2)Loosen and remove bolts securing rear flange of valve to forward flange of turbine vane cooling air duct assembly (AP04).
(3)Remove bolts securing turbine blade cooling air tube assembly (AP38) front flange to valve.
Pre SB PW4ENG 72-537 or Post SB PW4ENG 72-627
(a)Remove and discard the gaskets. Remove the metering plate and install the protective closures.
Post SB PW4ENG 72-537 and Pre SB PW4ENG 72-627
(b)Remove and discard the gaskets. Remove the ring spacer and install the protective closures.

End All SBs

(4)Remove bolt and nut securing tube clamp to bracket attached to valve flange.

(5)Remove bolts securing valve flange to engine pad.

NOTE : The use of a standard torque adapter will make the valve removal easier.

(6)Remove bracket and turbine vane and blade cooling air valve (left) from engine.
Discard metal gasket. Install protective closures to open tubes, duct and valve pad.

(a)If valve is to be replaced, remove tube adapter and gasket from valve. Install protective closure.

C. Installation (Ref. Fig. 404)

(1)Remove protective closures.

(2)If new valve is being installed, comply with the following :

NOTE : If the engine has the ring case style compressor, (Post SB PW4ENG 72-756), you must install a turbine vane and blade cooling air valve (Post PW4ENG 75-147) with the foolproofing pin hole to match the pin on the flange boss.

(a)With gasket on tube adapter and with threads lubricated with Engine Oil (Material No.P03-001), install to air supply (servo) port of valve.

(b)Tighten and TORQUE adapter to between 110 and 120 lbf.in. (1.24 and 1.36 m.daN).

(3)Install new metal gasket to pad on HPC case located in upper left side of engine at 10 o'clock position forward of Flange K and secure with Paraffin Wax (Material No.P05-059).

CAUTION : WITH A STANDARD TORQUE ADAPTER, ADJUST THE ACTUAL TORQUE WRENCH READING (REF. 70-00-00, P. BLOCK 201). TOO MUCH TORQUE CAN DAMAGE THE THREADED PARTS.

(4)Position valve and bracket to above pad and secure with bolts, threads lubricated with Engine Oil (Material No.P03-001). Use a standard torque adapter to tighten and TORQUE bolts between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Then without loosening, continue to tighten to same torque until torque is maintained.

(5)Install bolt, threads lubricated with Engine Oil (Material No.P03-001), and nut securing tube clamp to bracket mounted on flange of valve. TORQUE bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(6)Position new metal gasket between flanges of subject valve and turbine vane cooling air duct (AP04) and secure flanges with bolts, threads lubricated with Engine Oil (Material No.P03-001). Tighten and TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Then without loosening, continue to tighten to same torque until torque is maintained.

Pre SB PW4ENG 72-537 or Post SB PW4ENG 72-627

(7)Install the gasket to the four hole flanged end of the blade cooling air tube (AP38) and a second gasket to the mating flange of the valve and hold in place with Paraffin Wax (Material No.P05-059). Install the metering plate between the gaskets and attach the flange of the tube to the valve with bolts, threads lubricated with Engine Oil(Material

No.P03-001).
TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to the same torque until the torque is maintained.

Post SB PW4ENG 72-537 and Pre SB PW4ENG 72-627

(8)Install the gasket to the four hole flanged end of the blade cooling air tube (AP38) and a second gasket to the mating flange of the valve and hold in place with Paraffin Wax (Material No.P05-059). Install the ring spacer between the gaskets and attach the flange of the tube to the valve with bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then without loosening, continue to tighten to the same torque until the torque is maintained.

End All SBs

(9)Lubricate threads on air signal tube (AA19) with Engine Oil (Material No.P03-001). Install air signal tube to valve, and TORQUE to between 270 and 300 lbf.in. (3.05 an 3.38 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.

(10)Install starter upper duct

(a)Lubricate inside surface of duct coupling with Solid Film Lubricant (Material No.P06-013).

(b)Position duct on regulated pressure elbow (4). Place coupling seal between mating flanges.

(c)Verify that outside diameters of mating flanges are aligned radially within 0.06 inch (1.524 mm), and angular gap between mating faces of flanges is not greater than 0.04 inch (1.016 mm).

(d)Attach duct to regulated pressure elbow with coupling and seal. Tighten coupling fingertight.

(e)Lubricate inside surface of duct coupling with Solid Film Lubricant (Material No.P06-013).

(f)Position duct on starter intermediate duct. Place coupling seal between mating flanges.

(g)Verify that outside diameters of mating flanges are aligned radially within 0.06 inch (1.524 mm), and angular gap between mating faces of flanges is not greater than 0.04 inch (1.016 mm).

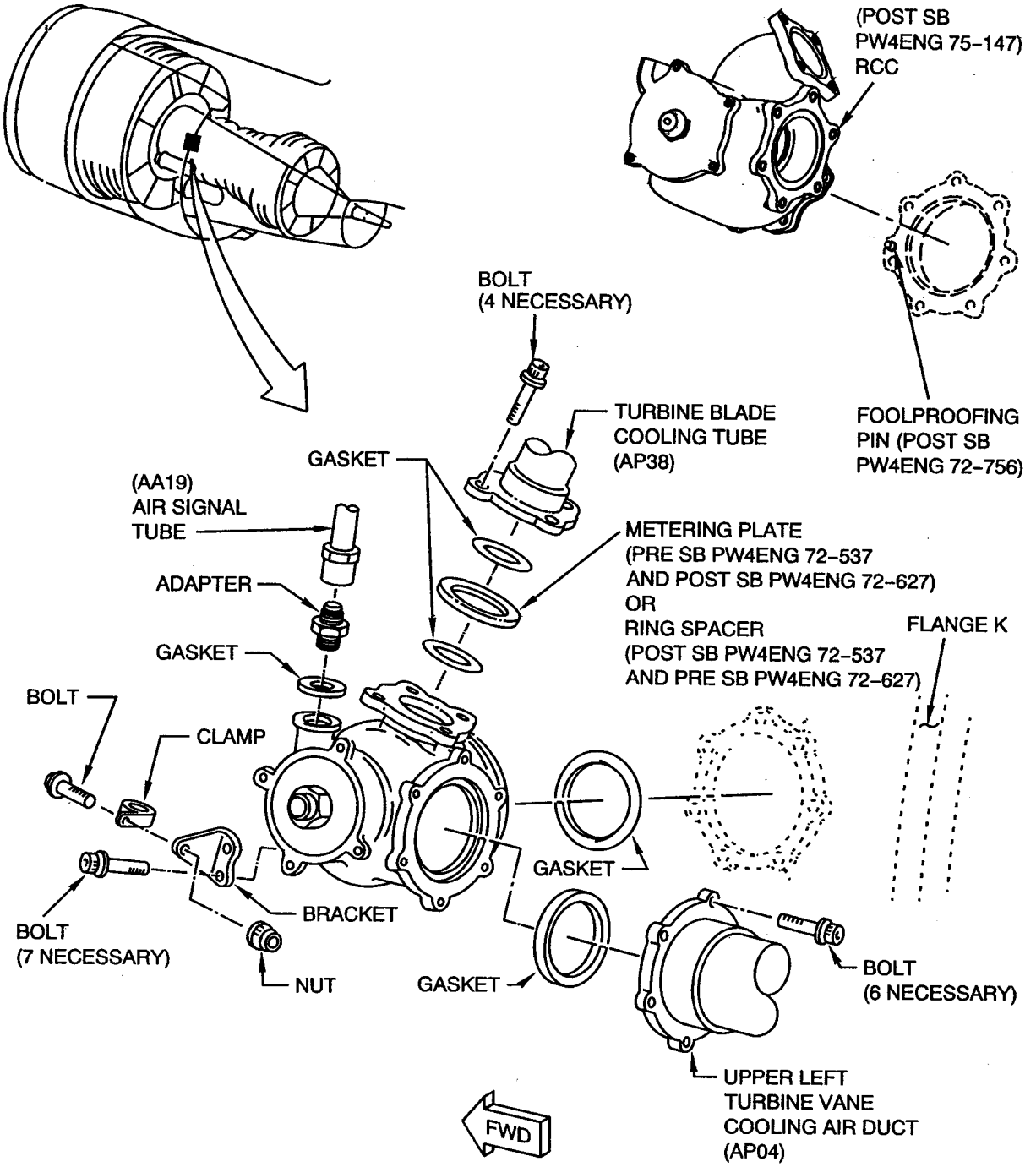
(h)Attach duct to starter intermediate duct with coupling and seal. Tighten coupling fingertight.

(i)Attach small tube support clamps to upper surface of duct, two places.

1 Secure high pressure bleed valve to pylon tube assembly to inner leg of forward and rearward supports on upper duct with clamps, washers and bolts. TORQUE bolts to between 20 and 25 lbf. in. (0.23 and 0.28 m.daN).

2 Secure bleed duct to precooler valve tube assembly and high pressure bleed valve to pylon tube assembly to outer leg of forward and rearward supports on upper duct with clamps, washers, and bolts. TORQUE bolts to between 20 and 25 lbf. in. (0.23 and 0.28 m.daN).

(j)TORQUE couplings to value marked on each coupling. Tap coupling lightly with a fiber hammer, then recheck torque.



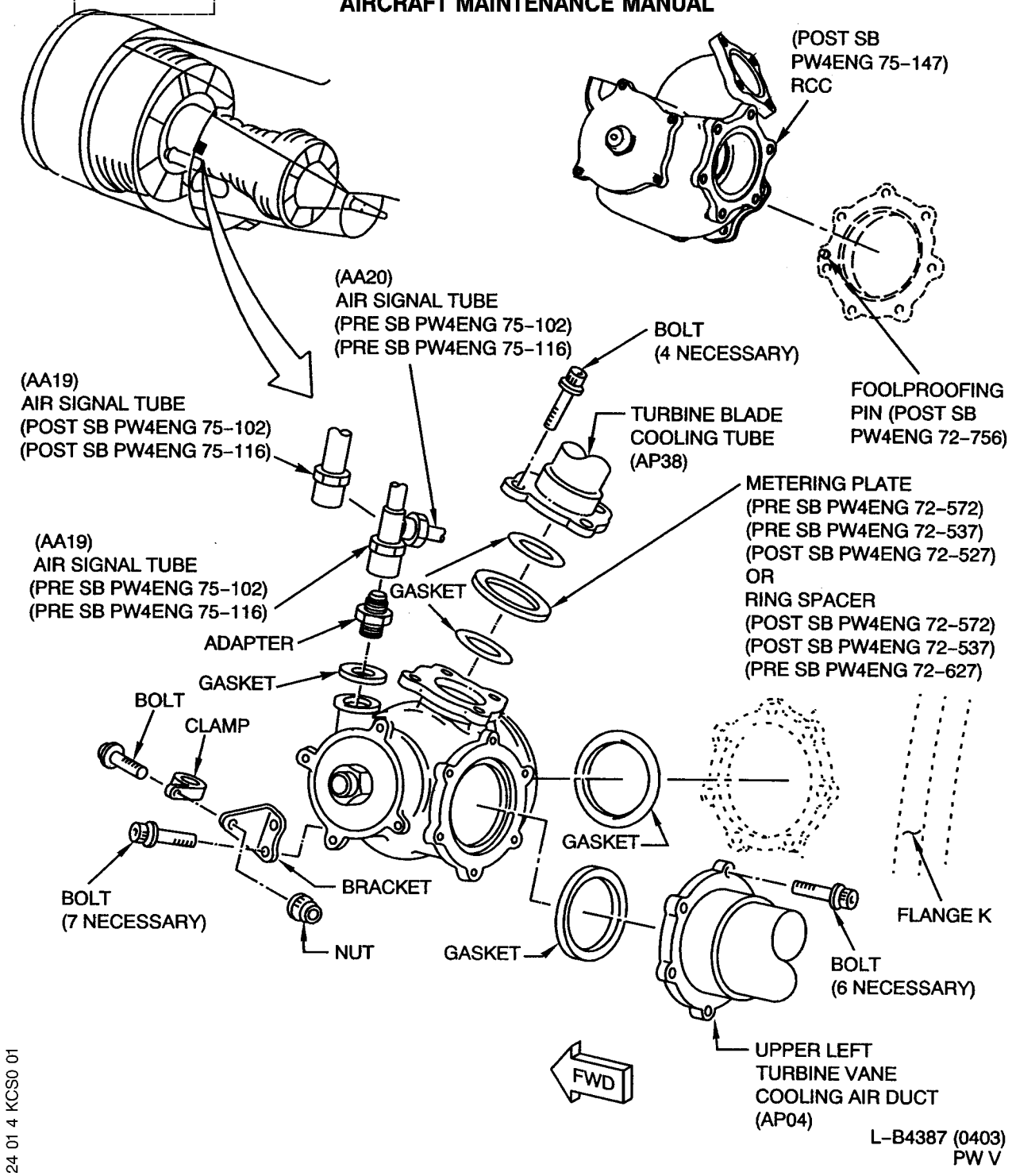
BM5 75 24 01 4 KCT0 01

Turbine Vane and Blade Cooling Air Valve (Left)
PHASE I Configuration
Figure 403

**ON A/C 101-200,

**ON A/C 101-200,

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Install upper-left-forward starter duct segment.
(3)Remove access platform.
(4)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers, (Ref. 71-13-00, P. Block 301).
(5)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).


(POST SB PW4ENG 75-147) RCC
(AA20) AIR SIGNAL TUBE (PRE SB PW4ENG 75-102) (PRE SB PW4ENG 75-116)
BOLT (4 NECESSARY)
(AA19) AIR SIGNAL TUBE (POST SB PW4ENG 75-102) (POST SB PW4ENG 75-116)
TURBINE BLADE COOLING TUBE (AP38)
FOOLPROOFING PIN (POST SB PW4ENG 72-756)
METERING PLATE (PRE SB PW4ENG 72-572) (PRE SB PW4ENG 72-537) (POST SB PW4ENG 72-527) OR RING SPACER (POST SB PW4ENG 72-572) (POST SB PW4ENG 72-537) (PRE SB PW4ENG 72-627)
(AA19) AIR SIGNAL TUBE (PRE SB PW4ENG 75-102) (PRE SB PW4ENG 75-116)
GASKET
ADAPTER
GASKET
BOLT
CLAMP
BRACKET
BOLT (7 NECESSARY)
NUT
GASKET
GASKET
FLANGE K
BOLT (6 NECESSARY)
FWD
UPPER LEFT TURBINE VANE COOLING AIR DUCT (AP04)
L-B4387 (0403) PW V
BM5 75 24 01 4 KCS0 01

Turbine Vane and Blade Cooling Air Valve (Left)
PHASE III Configuration
Figure 404

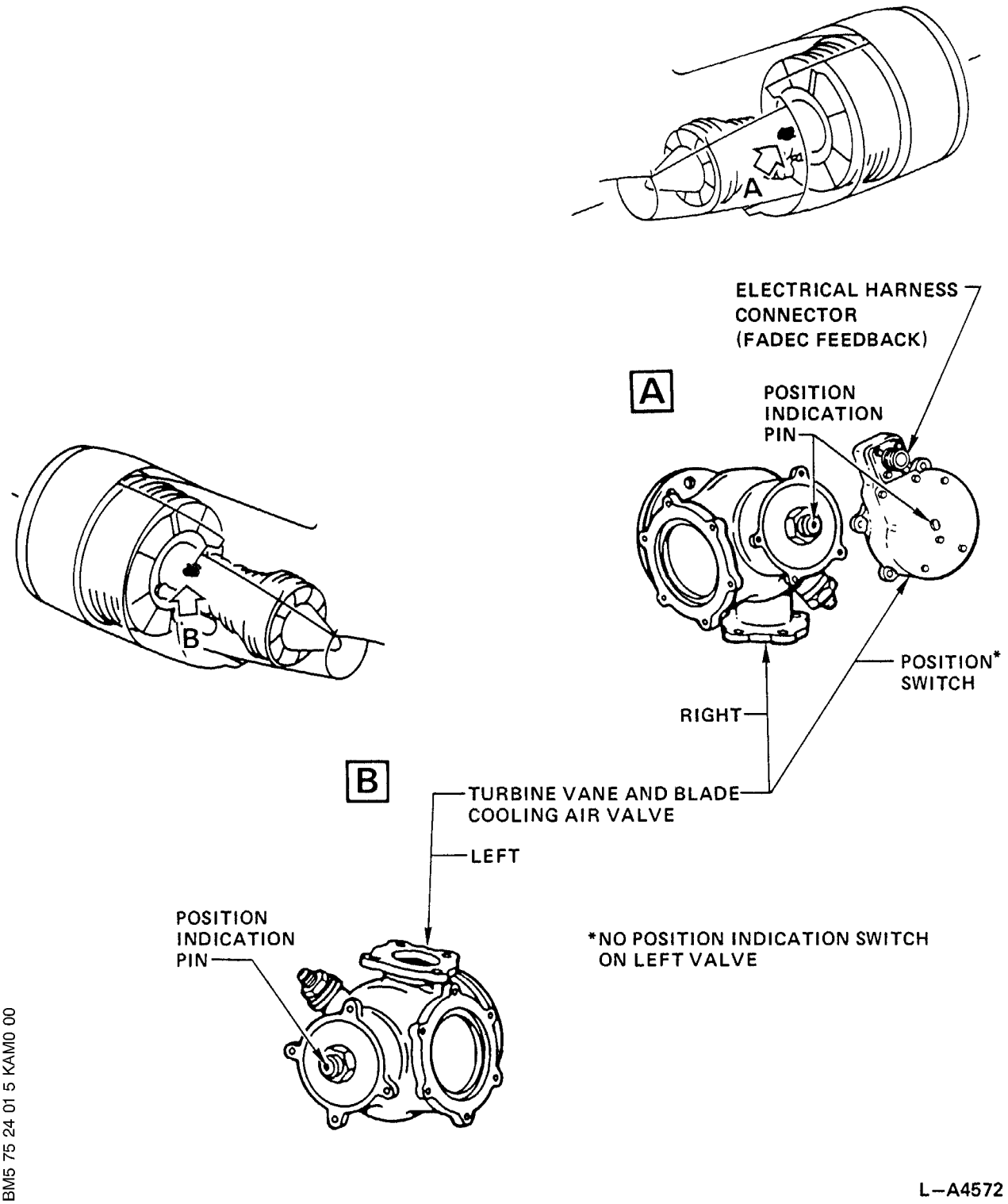
TURBINE VANE AND BLADE COOLING AIR VALVES - ADJUSTMENT/TEST

1. Check of TCA Valve Position Indicator Pin

A. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine.
(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(3)Install access platform.

B. Visual Inspection of the Position Indicator Pin
(1)Visually inspect position indicator pin on the TCA valve located on the HPC case (Ref. Fig. 501).
NOTE : The position indicator pin must be popped up. If the TCA valve indicator pin is not popped up, the valve is stuck in the closed position.

C. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).



Location of TCA Valves
Figure 501

TURBINE BLADE AND VANE AIR DUCTS - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Closures
C.	Gaskets
D.	Seal Plates
E.	Torque Wrench
F.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
G. Material No.P03-001	Oils (Ref. 70-00-00)
H. Material No.P05-059	Special Materials (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
R - 75-23-12, P. Block 401	Turbine Case Cooling (TCC) Inlet Duct

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal for PHASE I Configuration Engines

NOTE : This procedure is only available on aircraft equipped with PHASE I configured engines.

(1)Remove turbine vane cooling air duct upper right (AP01) as follows : (Ref. Fig. 401)

R (a)Remove TCC duct assembly (Ref. 75-23-12, P. Block 401).

(b)Remove lockwire and bolts securing rear flange of cooling air duct to boss on HPT case at approximately 1 o'clock position.

(c)Remove lockwire and bolts securing front flange of cooling air duct and bracket to boss on HPC case.

(d)Remove lockwire and bolts securing clamp to support on diffuser case and remove clamp.

(e)Remove cooling air duct from engine.

(f)Remove and discard the gasket from the boss on the HPC case.

(g)(Pre SB PW4ENG 72-315), Remove and discard the gasket (POST SB PW4ENG 75-57) from the boss on the HPT case.

(h)(POST SB PW4ENG 72-315), Remove and discard the metering orifice seal plate from the boss on the HPT case.

(i)Install protective closures.

(2)Remove turbine vane cooling air duct lower right (AP02) as follows : (Ref. Fig. 401)

(a)Remove lockwire, bolts, and bracket securing rear flange of cooling air duct to boss on HPT case at approximately 4 o'clock position.

(b)Remove bolts securing front flange of cooling air duct to flange of turbine and blade vane cooling air valve on HPC case.

(c)Remove bolts, nuts and clamp that attach the cooling air duct to the

bracket on Flange M and remove the duct from the engine. Discard the gasket from the front of the duct and the metering orifice seal plate (Engines without SB PW4ENG 75-57 and SB PW4ENG 72-315) or the gasket (Engines with SB PW4ENG 75-57 and SB PW4ENG 72-315).

(d)Install protective closures.

(3)Remove turbine vane cooling air duct upper left (AP04) as follows : (Ref. Fig. 403)

(a)Remove bolts securing front flange of cooling air duct to flange of turbine vane cooling air valve on HPC case.

(b)Remove lockwire and bolts securing rear flange of cooling air duct to boss on HPT case at approximately 9 o'clock position.

(c)Remove bolts, nuts, and clamp that hold the cooling air duct to the bracket on the diffuser case pad and remove the duct from engine. Discard the gasket (Engines with SB PW4ENG 72-315 and SB PW4ENG 75-57) or metering orifice seal plate (Engines without SB PW4ENG 72-315 and SB PW4ENG 75-57).

(d)Install protective closures.

CAUTION : REMOVE BORESCOPE PLUG (IF EQUIPPED) FROM LOWER LEFT TURBINE VANE COOLING AIR DUCT ELBOW PRIOR TO REMOVAL OF DUCT. FAILURE TO DO SO COULD RESULT IN DAMAGE TO PLUG.

(4)Remove turbine vane cooling air duct lower left (AP03) as follows : (Ref. Fig. 403)

(a)For engines equipped, remove lockwire and three bolts securing borescope plug to rear elbow. If necessary, use two jackscrews (.190-32 thread) and remove borescope plug evenly.

(b)Remove lockwire and bolts securing front flange of cooling air duct and tube bracket to boss on HPC case.

(c)Remove the bolt and nut that attach the No. 3 bearing pressure manifold (LP18) to the bracket on the front flange of the cooling air tube (AP03).

NOTE : The spray shield for the manifold can stay with the clamp.

(d)Loosen clamp bolt securing No. 4 bearing oil pressure tube (front) (LP15) to bracket at front flange of duct. Move the bracket to permit removal of the duct.

(e)Remove lockwire and bolts securing rear flange of cooling air duct to boss on HPT case at approximately the 7 o'clock position.

(f)Remove bolts, nuts, and clamp securing cooling air duct to bracket on diffuser case pad and remove cooling air duct from engine.

(g)Remove and discard the gasket from the boss on the HPC case.

(h)(Pre SB PW4ENG 72-315) Remove and discard the gasket (post SB PW4ENG 75-57) from the boss on the HPT case.

(i)(Post SB PW4ENG 72-315) Remove and discard the metering orifice seal plate from the boss on the HPT case.

(j)Install protective closures.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

B. Removal for PHASE III Configuration Engines

NOTE : This procedure is only available on aircraft equipped with PHASE III configured engines.

(1)Remove the (upper right) turbine vane cooling air duct (AP01) as follows. (Ref. Fig. 402)

(a)Remove TCC duct assembly (Ref. 75-23-12, P. Block 401).

(b)Remove the lockwire and bolts that attach the rear flange of the cooling air duct to the boss on the HPT case at approximately the 1 o'clock position.

Pre SB PW4ENG 75-114

(c)Remove the lockwire and non-silver plated bolts that attach the front flange of the cooling air duct to the flange of the turbine vane cooling air valve on the HPC case.

End Pre SB PW4ENG 75-114

Post SB PW4ENG 75-114

(d)Remove the lockwire and the silver plated bolts that attach the front flange of the cooling air duct to the flange of the turbine vane cooling air valve on the HPC case.

End SB PW4ENG 75-114

(e)Remove the lockwire and bolts that attach a clamp to the support on the diffuser case. Remove the clamp.

(f)Remove the cooling air duct from the engine.

(g)Remove and discard the gasket from the front flange of the duct.

(h)Remove the metering orifice seal plate from the boss on the HPT case and discard the plate.

(i)Install protection covers.

(2)Remove the (lower right) turbine vane cooling air duct (AP02) as follows. (Ref. Fig. 402)

(a)Remove the lockwire and bolts that attach the rear flange of the cooling air duct to the boss on the HPT case at approximately the 4 o'clock position.

(b)Remove the bolts which attach the front flange of the cooling air duct to the flange of the turbine vane and blade cooling air valve on the HPC case.

(c)Remove the bolts, nuts and clamp that holds the cooling air duct to the bracket on Flange M.
Remove the duct from the engine and discard the gaskets.

(d)Install protection covers.

(3)Remove turbine vane cooling air duct (upper Left) (AP04) as follows. (Ref. Fig. 403)

(a)Remove bolts securing front flange of cooling air duct to flange of turbine vane cooling air valve on HPC case.

(b)Remove lockwire and bolts that attach the rear flange of the cooling air duct to the boss on the HPT case at approximately the 9 o'clock position.

(c)Remove the bolts, nuts and clamp that attaches the cooling air duct to the bracket on the diffuser case pad and remove the duct from the engine.
Discard the gaskets.

(d)Install protective closures.

CAUTION : REMOVE BORESCOPE PLUG (IF EQUIPPED) FROM LOWER LEFT TURBINE VANE COOLING AIR DUCT ELBOW PRIOR TO REMOVAL OF DUCT. FAILURE TO DO SO COULD RESULT IN DAMAGE TO PLUG.

(4)Remove turbine vane cooling air duct (lower Left) (AP03) as follows. (Ref. Fig. 403)

(a)For engines equipped, remove lockwire and three bolts securing borescope plug to rear elbow. If necessary use two jackscrews (.190-32 thread) and remove borescope plug evenly.

(b)Remove lockwire and bolts securing front flange of cooling air duct and tube bracket to boss on HPC case.

(c)Remove the bolt and nut that attach the No. 3 bearing pressure manifold (LP18) to the bracket on the front flange of the cooling air tube (AP03).

NOTE : The spray shield for the manifold can stay with the clamp.

(d)Loosen clamp bolt securing No. 4 bearing oil pressure tube (front) (LP15) to bracket at front flange of duct. Move the bracket to permit removal of the duct.

(e)Remove lockwire and bolts securing rear flange of cooling air duct to boss on HPT case at approximately the 7 o'clock position.

(f)Remove bolts, nuts, and clamp securing cooling air duct to bracket on diffuser case pad and remove cooling air duct from engine.

(g)Remove and discard the gasket from the boss on the HPC case.

(h)Remove and discard the metering orifice seal plate from the boss on the HPT case.

(i)Install protective closures.

**ON A/C 101-200,

C. Installation for PHASE I Configuration Engine

NOTE : This procedure is only available on aircraft equipped with PHASE I configured engines.

(1)Install turbine vane cooling air duct upper right (AP01) as follows : (Ref. Fig. 401)

(a)Remove protective closures.

(b)Secure a new gasket in place on HPC case boss using Material No.P05-059 at approximately 2 o'clock position.

(c)(Pre SB PW4ENG 72-315) Secure a new gasket in place on HPT pad using Material No.P05-059 at approximately 1 o'clock position.

(d)(POST SB PW4ENG 72-315), Install a new metering orifice seal plate, convex side outward, in place to the pad at approximately at the 7 o'clock position on the HPT case with Material No.P05-059.

(e)Position cooling air duct to above pads and secure with bolts, threads lubricated with Material No.P03-001, with larger bolts at rear flange and bracket at front flange. Tighten bolts handtight only.

(f)Install clamp over cooling air duct at support on diffuser case. Secure with bolts, threads lubricated with Material No.P03-001. TORQUE bolts to between 65 and 85 lbf.in. (0.73 and 0.96 m.daN). Wire-lock bolts.

(g)TORQUE bolts at front flange to between 85 and 95 lbf.in. (0.96 and

1.07 m.daN) then retorque to same limit without loosening until torque is maintained. Wirelock bolts. TORQUE bolts at rear flange to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN) then retorque to same limit without loosening same torque is maintained. Wirelock bolts.

R (h)Install TCC duct assembly (Ref. 75-23-12, P. Block 401).

(2)Install turbine vane cooling air duct lower right (AP02) as follows : (Ref. Fig. 401)

(a)Remove protective closures.

(b)Install a new gasket in position on the flange of the turbine vane and blade cooling air valve with Material No.P05-059.

(c)Attach a new gasket or metering orifice seal plate in position on the HPT pad with Material No.P05-059 at approximately the 4 o'clock position.

(d)Install the cooling air duct to the HPT boss and to the rear of cooling air valve and hold in position with bolts, threads lubricated with Material No.P03-001.
Tighten bolts handtight only.

(e)Position clamp over cooling air duct at bracket on Flange M and secure with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(f)TORQUE bolts at front flange to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then retorque to same limit until torque is maintained. TORQUE bolts at rear flange to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN) then retorque to same limit without loosening until torque is maintained. Wirelock bolts at rear flange of duct.

(3)Install turbine vane cooling air duct upper left (AP04) as follows : (Ref. Fig. 403)

(a)Remove protective closures

(b)Secure a new gasket in place on flange of turbine cooling air valve with Material No.P05-059.

(c)Secure a new gasket in place on HPT pad using Material No.P05-059 at approximately 9 o'clock position.

(d)Position cooling air duct to HPT boss and to rear of cooling air valve and secure with bolts, threads lubricated with Material No.P03-001, larger bolts at rear flange. Tighten bolts handtight only.

(e)Position clamp to cooling air duct at bracket on diffuser case and secure with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(f)TORQUE bolts at forward flange to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then retorque to same limit without loosening until torque is maintained. TORQUE bolts at rear flange to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN) then retorque to same limit without loosening until torque is maintained. Wirelock bolts at rear flange of duct.

(4)Install turbine vane cooling air duct lower left (AP03) as follows : (Ref. Fig. 403)

(a)Remove protective closures

(b)Secure a new gasket in place on HPC boss with Material No. P05-059 at approximately 3 o'clock position.

(c)(Pre SB PW4ENG 72-315) Secure a new gasket in place on HPT pad using

Material No.P05-059 at approximately 7 o'clock position.

(d)(POST SB PW4ENG 72-315), Install a new metering orifice seal plate, convex side outward, in place to the pad at approximately at the 7 o'clock position on the HPT case with Material No.P05-059.

(e)Position cooling air duct to above pads and secure with bolts, threads lubricated with Material No.P03-001, with larger bolts at rear flange and bracket at front flange. Tighten bolts handtight only.

(f)Align boltholes of bracket (attached to No. 4 bearing oil pressure tube) with boltholes in front flange of duct. Secure front flange and bracket with bolts, threads lubricated with Material No.P03-001. Tighten bolts handtight only.

(g)Position clamp over duct at bracket on diffuser case boss and secure to bracket with bolts, threads lubricated with Material No.P03-001, and nuts. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(h)TORQUE bolts at front flange to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN) then retorque to same limit without loosening until torque is maintained. Wirelock bolts. TORQUE bolts at rear flange to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN), then retorque to same limit without loosening until torque is maintained. Wirelock bolts.

(i)TORQUE clamp bolt that attaches the No. 4 bearing oil pressure tube to between 36 and 40 lbf in. (0.40 and 0.45 m.daN).

(j)Install a bolt, threads lubricated with Material No.P03-001 and a nut to the clamp that attaches the No. 3 bearing pressure manifold (LP18) to the bracket on the front flange of the cooling air tube. Adjust the spray shield on the inboard side of the manifold and TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

(k)For engines equipped, install gasket to borescope plug groove. Install plug to rear elbow and engage end of plug into inner hole to seat. Install three bolts, threads lubricated with Material No. P03-001. TORQUE bolts to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN), then retorque to same limit without loosening until torque is maintained.
Secure with lockwire.

D. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Close thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

C. Installation for PHASE III Configuration Engine

NOTE : This procedure is only available on aircraft equipped with PHASE III configured engines.

(1)Install the (upper right) turbine vane cooling air duct (AP01) as

follows. (Ref. Fig. 402)
(a)Remove the protective covers.
(b)Install a new gasket to the front flange of the cooling air duct. Attach the gasket to the duct flange with Material No.P05-059.
(c)Install a new metering orifice seal plate, convex side outward, to the HPT pad located approximately at the 1 o'clock position. Attach the plate with Material No.P05-059.

Pre SB PW4ENG 75-114

(d)Install the cooling air duct to the HPT pad and to valve flange. Attach the duct with non-silver plated bolts, threads lubricated with Material No.P03-001, with the larger bolts at the rear flange. Tighten the bolts by hand.

End Pre SB PW4ENG 75-114

Post SB PW4ENG 75-114

(e)Install the cooling air duct to the HPT pad and to the valve flange. Attach the duct with bolts, threads lubricated with Material No.P03-001, with the larger non-silver plated bolts at the rear flange and the silver plated bolts to the valve flange. Tighten the bolts by hand.

End SB PW4ENG 75-114

(f)Install a clamp over the cooling air duct at the support on the diffuser case at approximately the 2 o'clock position. Attach the clamp to the support with bolts, threads lubricated with Material No.P03-001. TORQUE the bolts to between 65 and 85 lbf.in. (0.74 and 0.84 m.daN) and wirelock the bolts.
(g)TORQUE the bolts at the front flange to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Continue to TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN) until the torque is kept. Wirelock the bolts.
(h)TORQUE the bolts at the rear flange to between 180 and 200 lbf.in. (2.04 and 2.25 m.daN). Continue to TORQUE the bolts to 180 and 200 lbf.in. (2.04 and 2.25 m.daN) until the torque is kept. Wirelock the bolts.
(i)Install TCC duct assembly (Ref. 75-23-12, P. Block 401).

(2)Install the (lower right) turbine vane cooling air duct (AP02) as follows. (Ref. Fig. 402)
(a)Remove protective closures.
(b)Install a new gasket to the flange of the turbine vane and blade cooling air valve and hold in position with Material No.P05-059.
(c)Install a new gasket to the HPT pad at approximately the 4 o'clock position and hold in position with Material No.P05-059.
(d)Install the cooling air duct to the HPT boss and to the rear of the cooling air valve and attach with bolts, threads lubricated with Material No.P03-001, larger bolts at rear flange. Tighten the bolts by hand.
(e)Install the clamp over the cooling air duct and to the bracket on Flange M. Attach with bolts, threads lubricated with Material No.P03-001, and nuts.
TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
(f)TORQUE the bolts at the front flange to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Continue to TORQUE the bolts until the torque is kept.

TORQUE the bolts at the rear flange to between 180 and 200 lbf.in. (2.04 and 2.25 m.daN). Continue to torque the bolts until the torque is kept. Wirelock the bolts at the rear flange of the duct.

(3)Install turbine vane cooling air duct upper left (AP04) as follows : (Ref. Fig. 403)

(a)Remove protective closures

(b)Secure a new gasket in place on flange of turbine cooling air valve with Material No.P05-059.

(c)Secure a new gasket in place on HPT pad using Material No.P05-059 at approximately 9 o'clock position.

(d)Position cooling air duct to HPT boss and to rear of cooling air valve and secure with bolts, threads lubricated with Material No.P03-001, larger bolts at rear flange. Tighten bolts handtight only.

(e)Position clamp to cooling air duct at bracket on diffuser case and secure with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(f)TORQUE bolts at forward flange to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN), then retorque to same limit without loosening until torque is maintained. TORQUE bolts at rear flange to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN) then retorque to same limit without loosening until torque is maintained. Wirelock bolts at rear flange of duct.

(4)Install turbine vane cooling air duct lower left (AP03) as follows : (Ref. Fig. 403)

(a)Remove protective closures

(b)Secure a new gasket in place on HPC boss with Material No. P05-059 at approximately 3 o'clock position.

(c)Install a new metering orifice seal plate, convex side outward, to the pad at approximately the 7 o'clock position on the HPT case and hold in position with Material No.P05-059.

(d)Position cooling air duct to above pads and secure rear of duct with bolts, threads lubricated with Material No.P03-001, larger bolts at rear flange tighten with handtight only.

(e)Align boltholes of bracket (attached to No. 4 bearing oil pressure tube) with boltholes in front flange of duct. Secure front flange and bracket with bolts, threads lubricated with Material No.P03-001. Tighten bolts handtight only.

(f)Position clamp over duct at bracket on diffuser case boss and secure to bracket with bolts, threads lubricated with Material No.P03-001, and nuts.
TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(g)TORQUE bolts at front flange to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN) then retorque to same limit without loosening until torque is maintained. Wirelock bolts. TORQUE bolts, at rear flange to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN) then retorque to same limit without loosening until torque is maintained. Wirelock bolts.

(h)TORQUE the clamp bolt that attaches the No. 4 bearing oil pressure tube to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

(i)Install a bolt, threads lubricated with Material No.P03-001 and a nut to the clamp that attaches the No. 3 bearing pressure manifold (LP18) to the bracket on the front flange of the cooling air tube. Adjust the

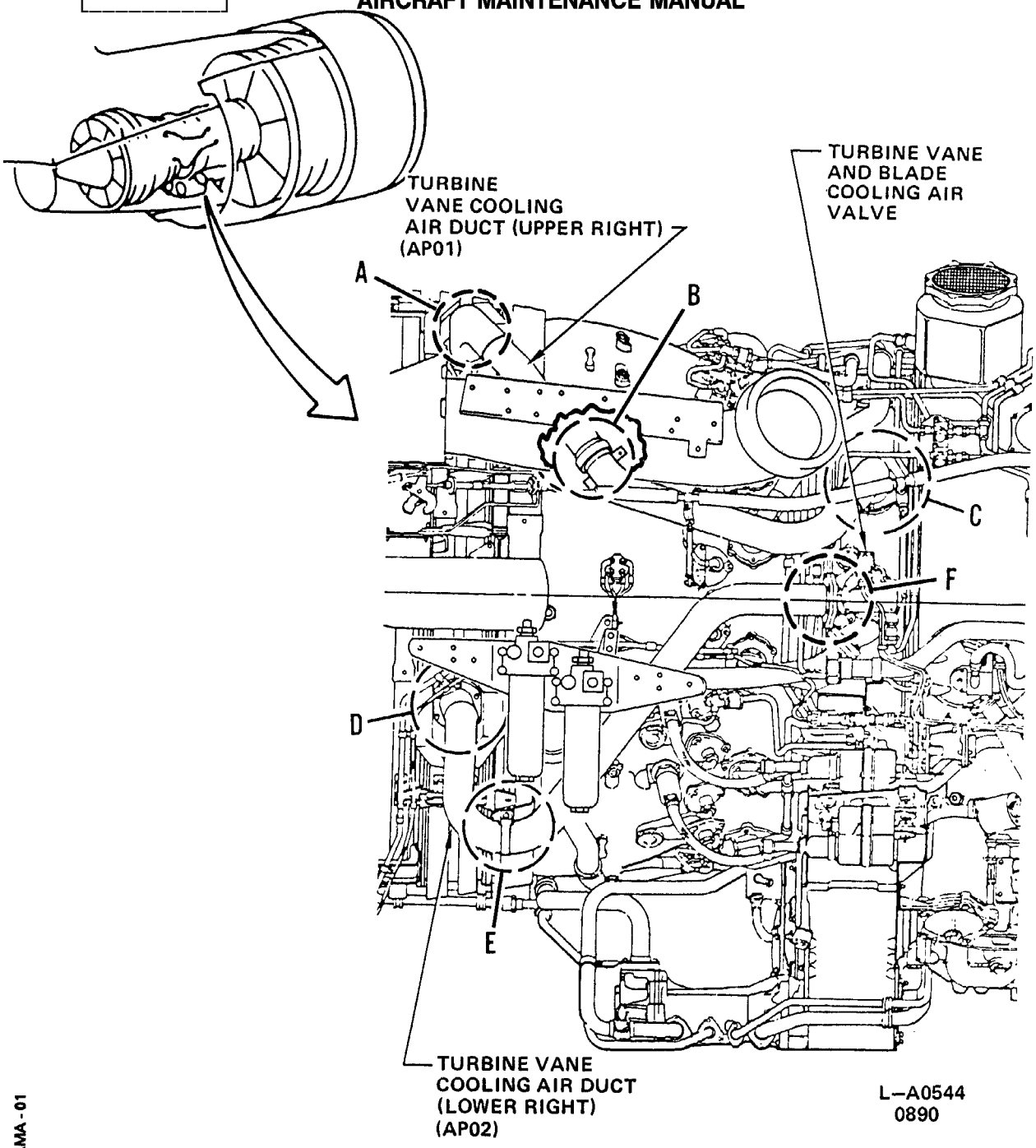
spray shield on the inboard side of the manifold and TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

(j) For engines equipped, install gasket to borescope plug groove. Install plug to rear elbow and engage end of plug into inner hole to seat. Install three bolts, threads lubricated with Material No.P03-001. TORQUE bolts to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN), then retorque to same limit without loosening until torque is maintained.
Secure with lockwire.

D. Close-Up

(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2) Close thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



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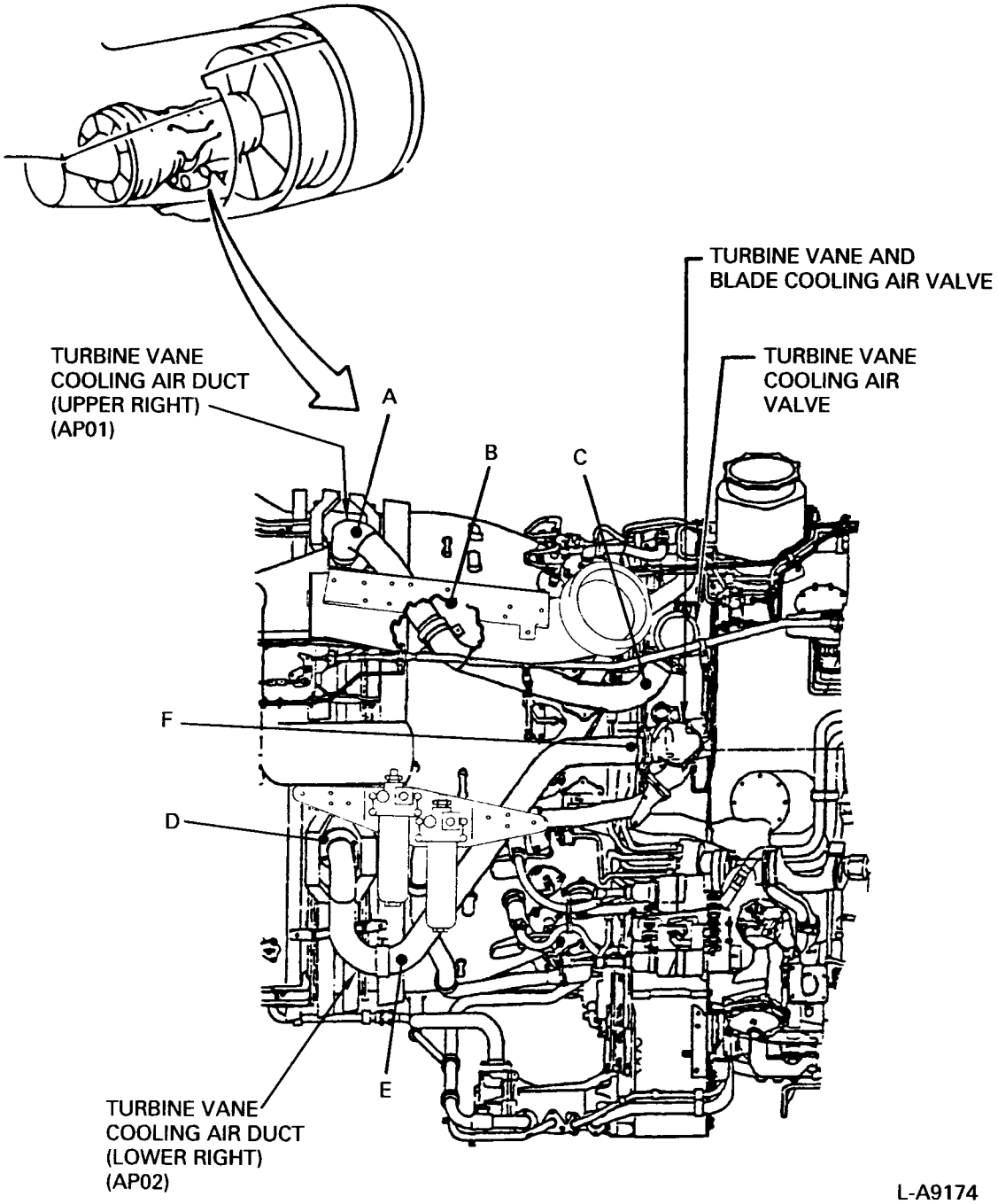
Turbine Vane Cooling Air Ducts (Right Side)
For PHASE I Configuration (Sheet 1/3)
Figure 401

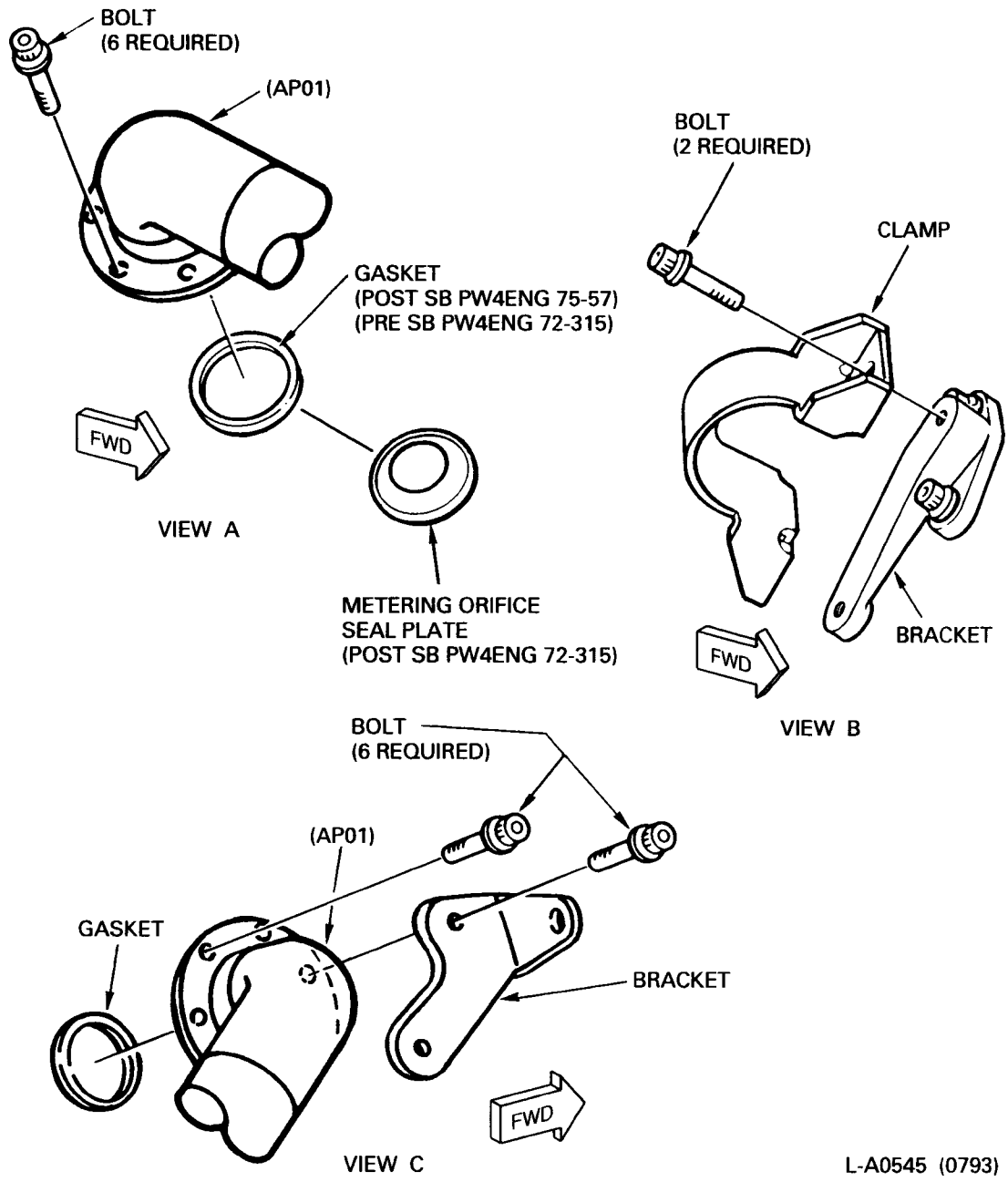
R



BM5 75 24 03 4 KATA 00

Turbine Vane Cooling Air Ducts (Right Side)
For PHASE III Configuration (Sheet 1/3)
Figure 402

R



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Turbine Vane Cooling Air Ducts (Right Side)
For PHASE I Configuration (Sheet 2/3)
Figure 401

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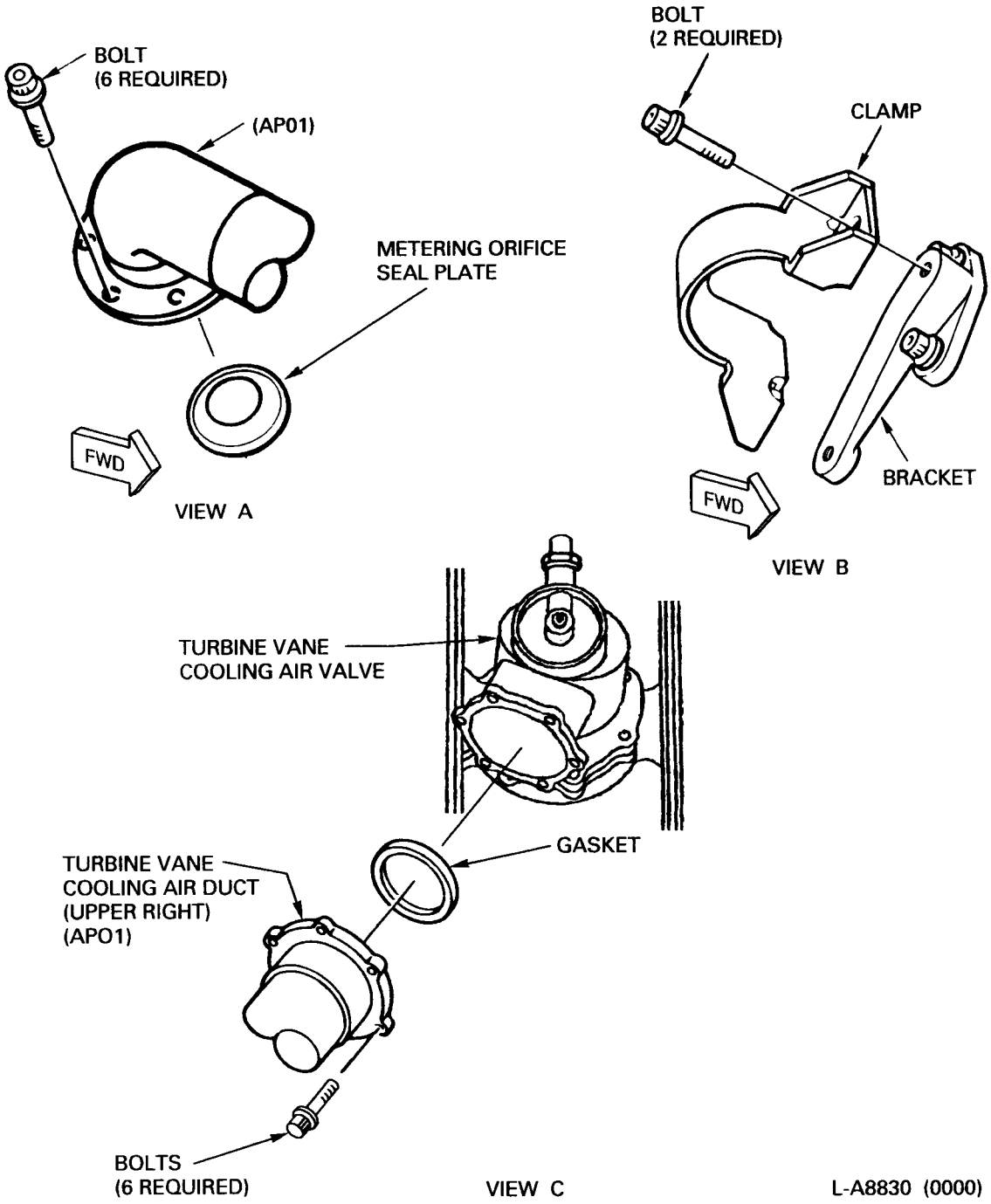

BM5 75 24 03 4 KATB 00

Turbine Vane Cooling Air Ducts (Right Side)
For PHASE III Configuration (Sheet 2/3)
Figure 402

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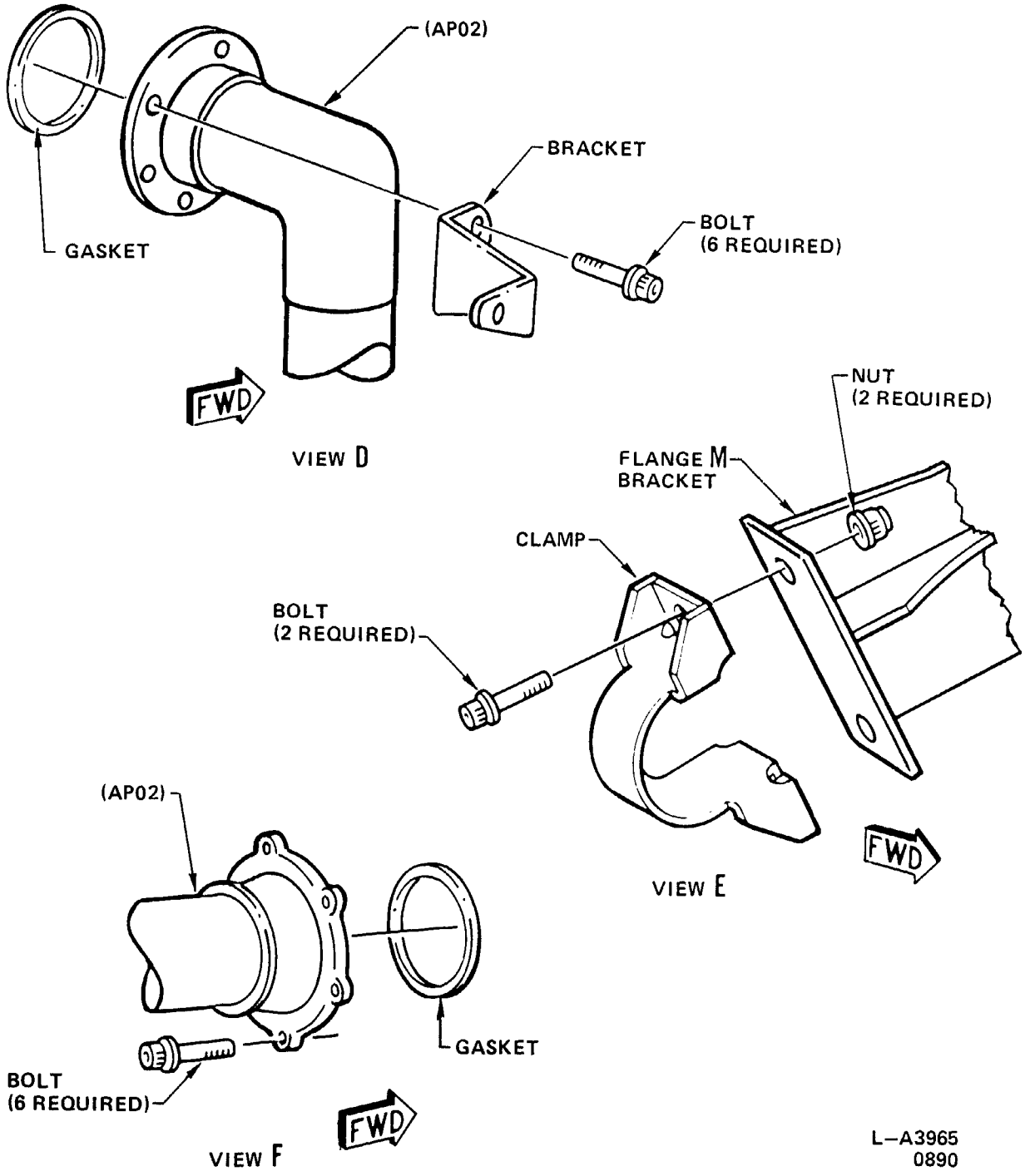

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Turbine Vane Cooling Air Ducts (Right Side)
For PHASE I Configuration (Sheet 3/3)
Figure 401

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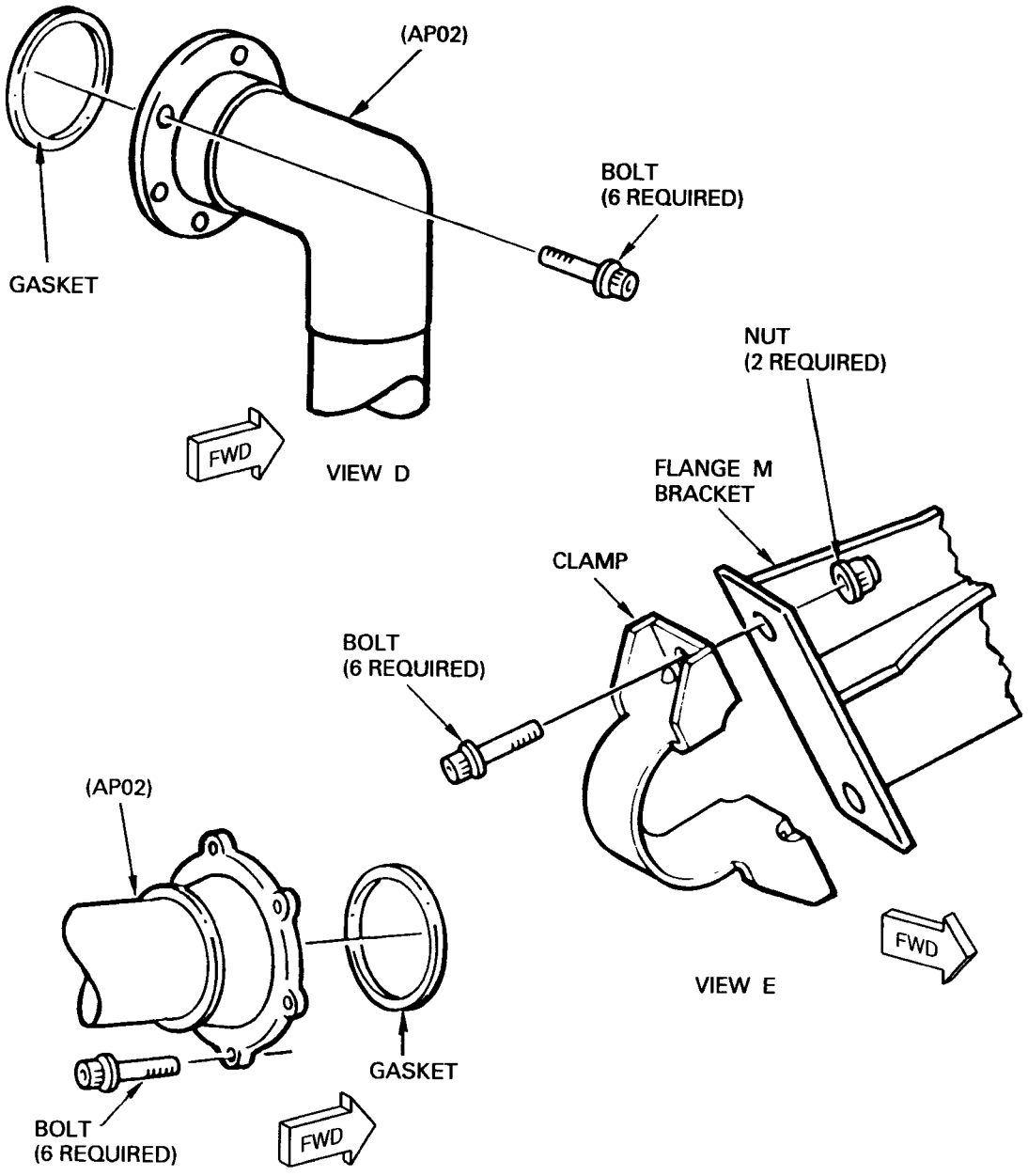

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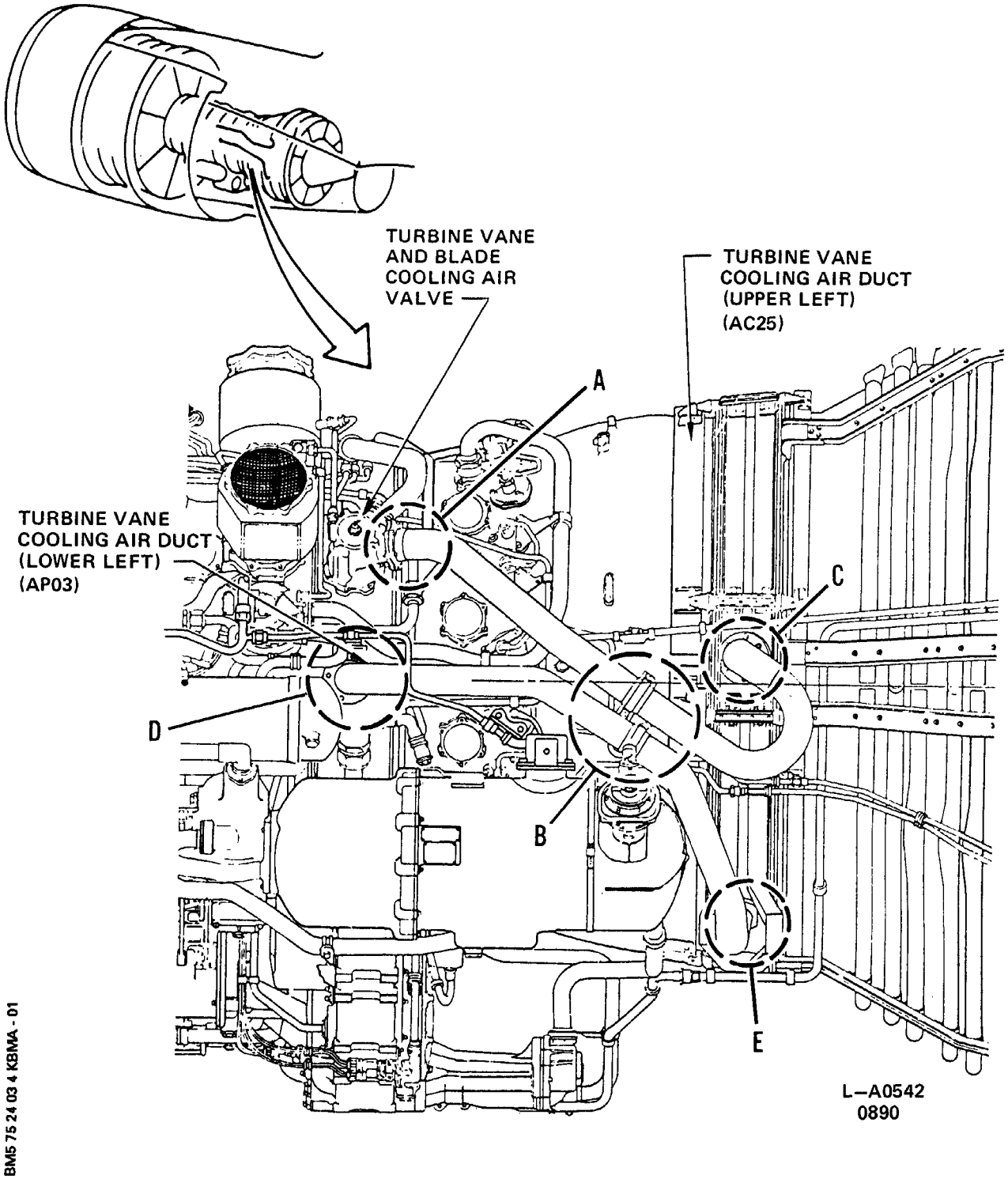
Turbine Vane Cooling Air Ducts (Right Side)
For PHASE III Configuration (Sheet 3/3)
Figure 402

R



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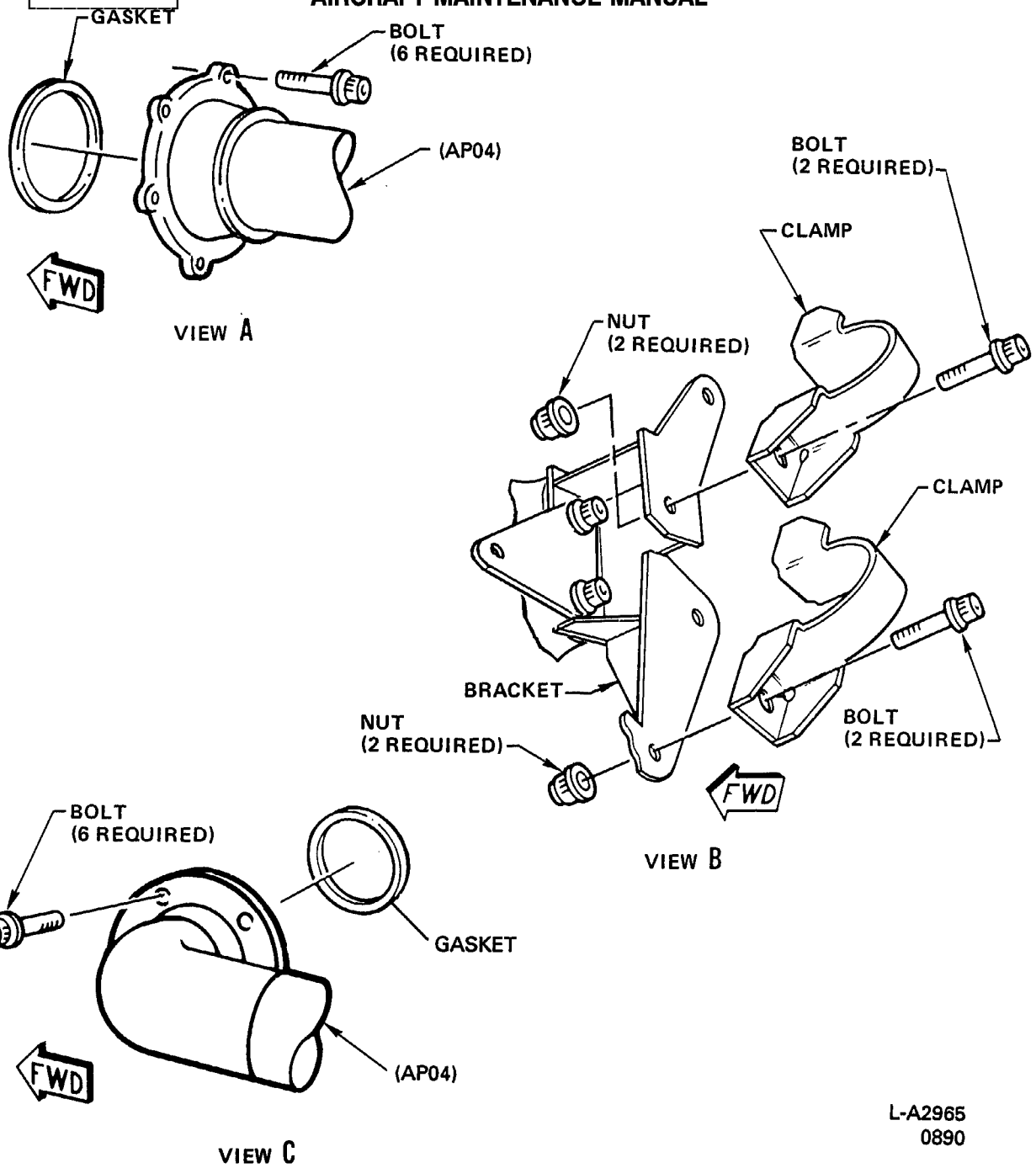
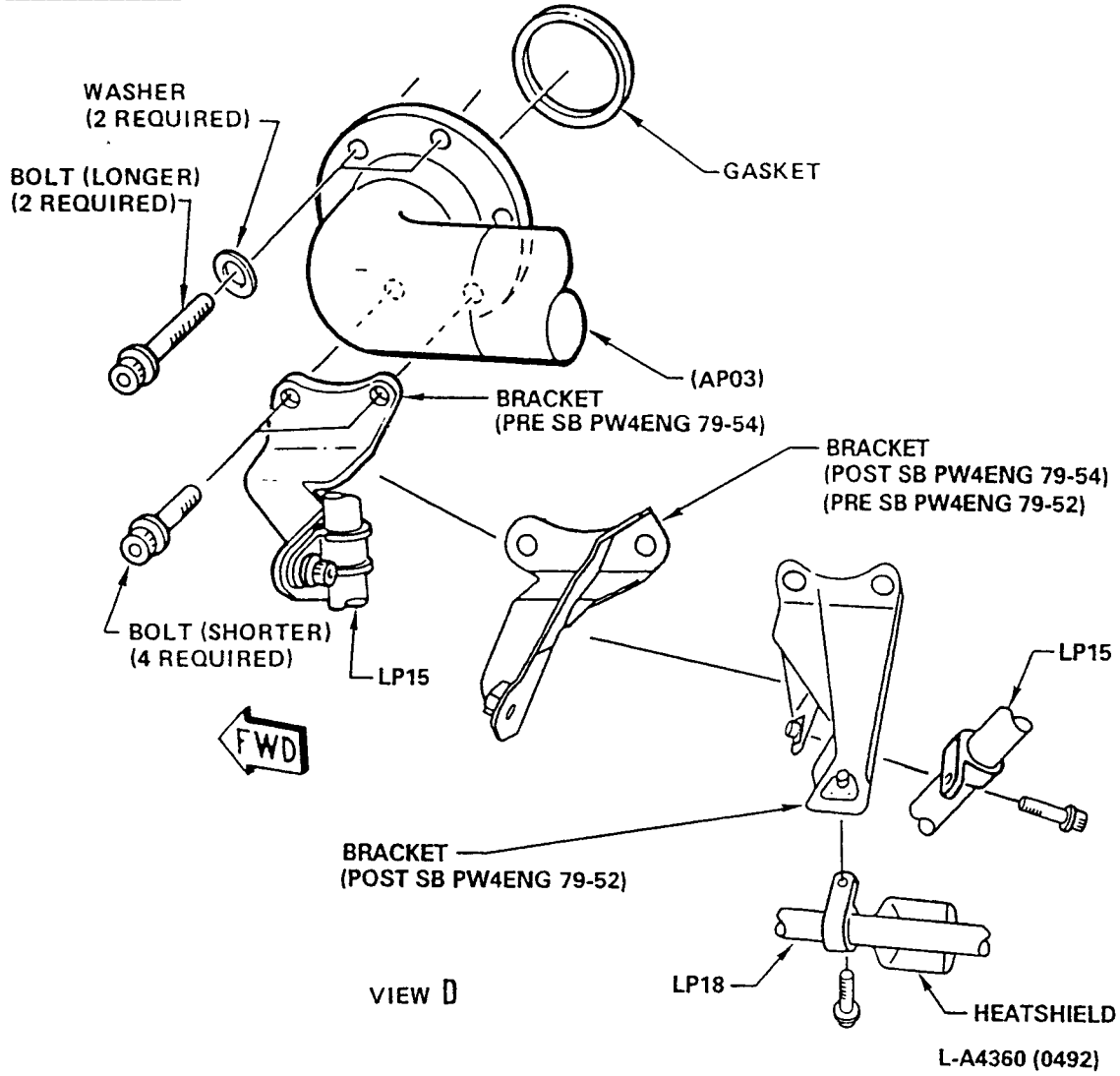
Turbine Vane Cooling Air Ducts (Left Side) (Sheet 1/4)
Figure 403



Turbine Vane Cooling Air Ducts (Left Side) (Sheet 2/4)
Figure 403



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Turbine Vane Cooling Air Ducts (Left Side)
For PHASE I Configuration (Sheet 3/4)
Figure 403

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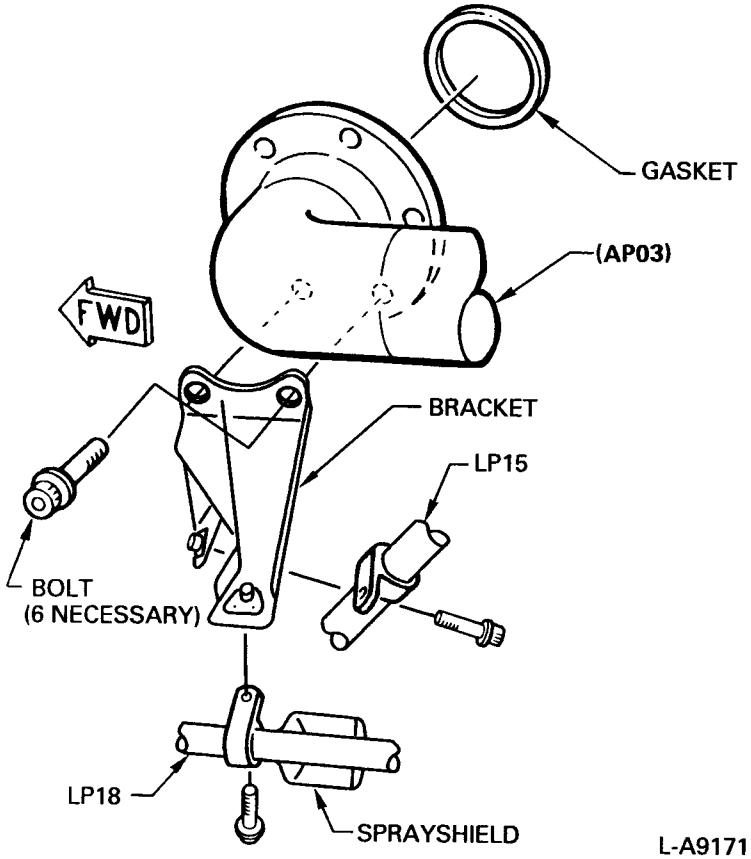

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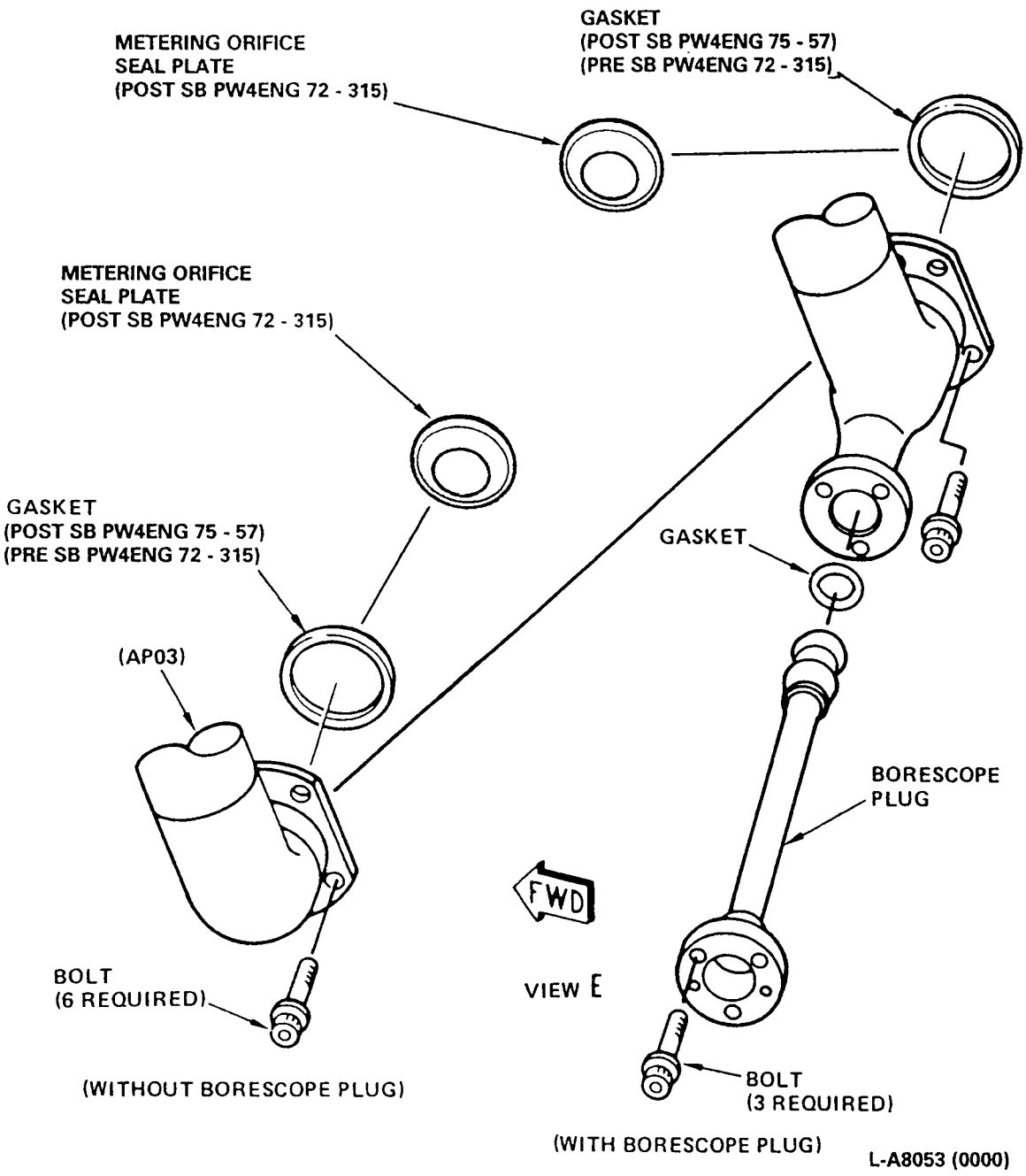
Turbine Vane Cooling Air Ducts (Left Side)
For PHASE III Configuration (Sheet 3/4)
Figure 403

R



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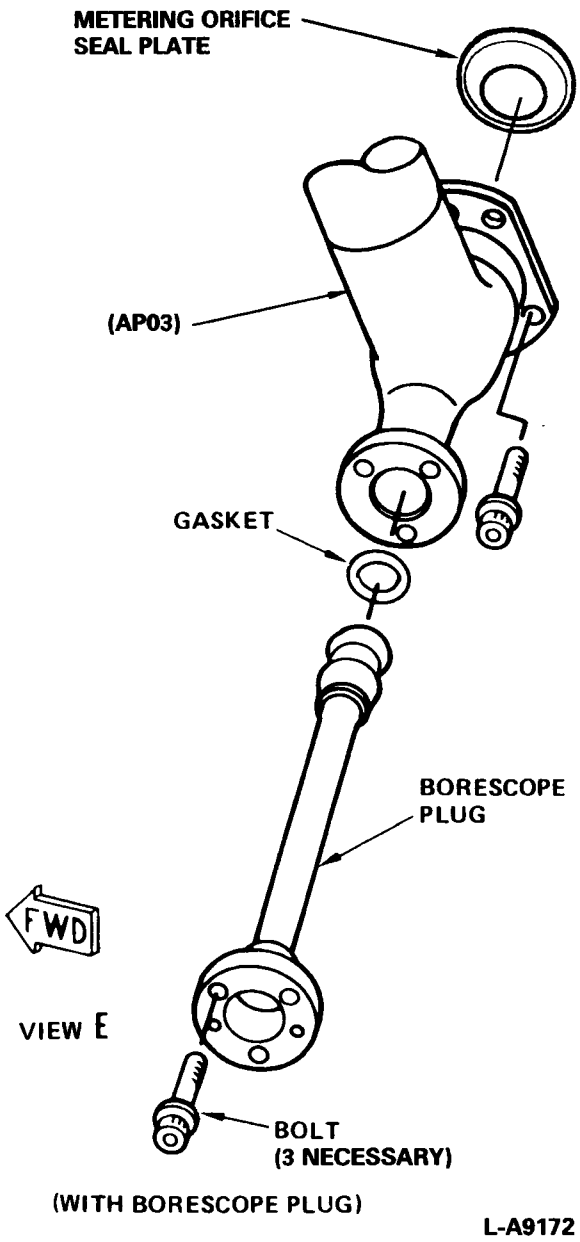
Turbine Vane Cooling Air Ducts (Left Side)
For PHASE I Configuration (Sheet 4/4)
Figure 403

R



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Turbine Vane Cooling Air Ducts (Left Side)
For PHASE III Configuration (Sheet 4/4)
Figure 403

R

TURBINE VANE AND BLADE COOLING AIR VALVE POSITION SWITCH - REMOVAL/INSTALLATION

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Torque Wrench
C.	Access Platform
D. Material No.P03-001	Oils (Ref. 70-00-00)
E.	Corrosion Resistant Steel Lockwire (AS3214-01) (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
Engine 1			
133VU	ENG1 - SCU SUPPLY GND	35KS	333/T76
133VU	ENG1 - SCU SUPPLY FLT	37KS	333/T75
Engine 2			
133VU	ENG2 - SCU SUPPLY GND	34KS	333/T85
133VU	ENG2 - SCU SUPPLY FLT	36KS	333/T84

(2)Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(3)Install access platform.

B. Removal (Ref. Fig. 401)

NOTE : This procedure is applicable for engines without SB PW4ENG 72-572 or SB PW4ENG 75-106 or SB PW4ENG 75-756 or SB PW4ENG 75-759 or SB PW4ENG 75-147 only.

(1)Disconnect W4P21 harness connector from turbine vane and blade cooling air valve position switch on turbine vane cooling air valve on right side of engine on HPC case at approximately the 3 o'clock position. Install protective closures.

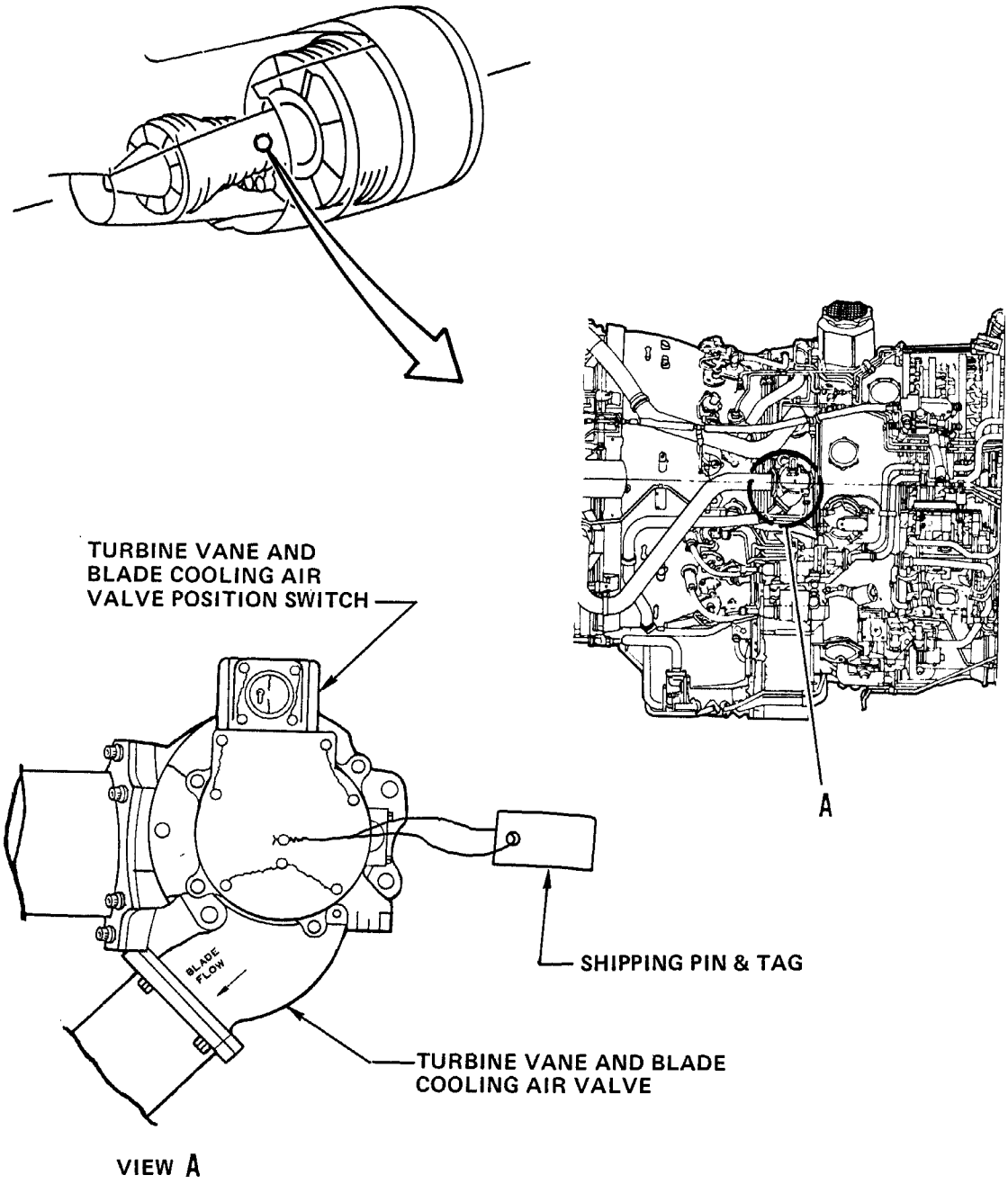
(2)Remove bolts securing position switch. To outer surface of turbine vane cooling air valve and remove position switch from engine.

C. Installation (Ref. Fig. 401)

NOTE : This procedure is applicable for engines without SB PW4ENG 72-572 or SB PW4ENG 75-106 or SB 75-756 or SB PW4ENG 75-759 or SB PW4ENG 75-147 only.

(1)Position turbine vane and blade cooling air valve position switch to turbine vane and blade cooling air valve aligning bolt holes for proper positioning.
(Ref. Fig. 401)
(2)Secure position switch to valve with bolts, threads lubricated with Engine Oil, Material No.P03-001. TORQUE bolts to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN).
(3)Remove protective closures. Connect W4P21 harness connector to connector on position switch.
CAUTION : ENSURE SPECIFIED TORQUE WRENCH READING IS ADHERED TO. INCORRECT CONNECTOR TORQUE COULD RESULT IN CONNECTOR DAMAGE AND INADEQUATE LIGHTNING PROTECTION.
(a)TORQUE connector to between 30 and 35 lbf.in. (0.34 and 0.40 m.daN) and wirelock with AS3214-01
(4)If necessary, remove the shipping cotter pin and tag from the face of the switch.

D. Close-Up and Test
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close right thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers : 34KS, 35KS, 36KS and 37KS



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BM5 75 24 13 4 KAMO - 01

Turbine Vane and Blade Cooling Air Valve Position Switch
Figure 401

TURBINE VANE AND BLADE COOLING AIR VALVE FILTER - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Access Platform
B.	Circuit Breaker Safety Clips
C. Material No.P03-001	Oils (Ref. 70-00-00)
R D. Material No.P06-054	Lubricants (Ref. 70-00-00)
E.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
F.	Corrosion Resistant Steel Lockwire (MS20995C32) (Ref. 70-00-00)
G.	Torque Wrench
H. Material No.P06-021	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
R - 75-33-02, P. Block 401	HPC Secondary Flow Control Valve Filter

2. Filter Assembly

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Removal for Phase I Engine Configuration (Ref. Fig. 401)
(1)Remove lockwire and disconnect tubes from upper air filter at approximately 11 o'clock position.
(2)Remove bolts and nuts securing air filter to flange J bracket and remove filter.
(3)Install protective closures.
NOTE : For removal of remaining air filters (Ref. 75-33-02, P. Block 401).

C. Installation for Phase I Engine Configuration (Ref. Fig. 401)
(1)Position air filter (hex adapter forward) to upper mounting holes in Flange J bracket at approximately 11 o'clock position. Secure filter to bracket with bolts, threads lubricated with Material No.P03-001, and nuts. TORQUE bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
(2)Remove protective closures.
R (3)Install tube nuts, threads lubricated with Material No.P06-054, to filter. TORQUE tube nuts to between 200 and 225 lbf. in. (2.24 and 2.54 m.daN). Secure forward tube with lockwire to forward hex adapter. Secure rear tube with lockwire to filter cover.
NOTE : Using corrosion resistant steel lockwire AS3214-02.
NOTE : For installation of remaining air filters (Ref. 75-33-02, P. Block 401).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

B. Removal for Phase III Engine Configuration (Ref. Fig. 402)
NOTE : This procedure is available for the turbine vane and blade cooling air valve filter and turbine vane cooling air valve filter.
(1)Remove lockwire and disconnect the tubes from the upper and lower air filters at approximately 11 o'clock position.
(2)Remove the bolts and the nuts which attach the air filters to the flange J bracket and remove the filters.
(3)Install protective closure.
(4)Remove lockwire and disconnect the tubes from the upper and lower air filters at approximately the 1:30 o'clock position.
(5)Remove the bolts and the nuts which attach the air filters to the flange J bracket and remove the filters.
(6)Install protective closure.

C. Installation for Phase III Engine Configuration (Ref. Fig. 402)
NOTE : This procedure is available for the turbine vane and blade cooling air valve filter and the turbine vane cooling air valve filter.
(1)Install an air filter to the lower holes in the Flange J bracket at approximately the 11 o'clock position. Attach the filter to the bracket with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE the bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
(2)Install an air filter to the upper holes in the Flange J bracket at approximately the 11 o'clock position. Attach the filter to the bracket with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE the bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
(3)Remove protective closures.
(4)Install tubes (AA06), (AA76), (AA18) and (AA19) with tube nut threads lubricated with Antigalling Compound (P06-021), to the fittings on the lower and upper filters. TORQUE the tube nuts to between 200 and 225 lbf.in. (2.24 and 2.54 m.daN). Attach the forward tubes with lockwire to the forward hex adapters. Attach the rear tube with lockwire to the filter covers.
(5)Install an air filter to the lower holes in the Flange J bracket at approximately the 1:30 o'clock position.
Attach the filter to the bracket with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE the bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
(6)Install an air filter to the upper holes in the Flange J bracket at approximately the 1:30 o'clock position.
Attach the filter to the bracket with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE the bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
(7)Remove protective closures.
(8)Install tubes (AA77), (AA01), (AA23) and (AA24) with tube nut threads

lubricated with Material No.P06-021, to the fittings on the lower and upper filters. TORQUE the tube nuts to between 200 and 225 lbf.in. (2.24 and 2.54 m.daN). Attach the forward tubes with lockwire to the forward hex adapters. Attach the rear tube with lockwire to the filter covers.

**ON A/C 101-200,

D. Close-Up
(1)Remove access platform.
(2)Close left thrust reverser and fan cowl doors, and remove safety clips and tags, and close circuit breakers (Ref. 71-13-00, P. Block 301).

3. Filter Element

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. For Phase I Engine Configuration
(Ref. Fig. 403)
NOTE : For removal/installation of remaining filter elements, Ref. 75-33-02, P. Block 401.

**ON A/C 101-105,

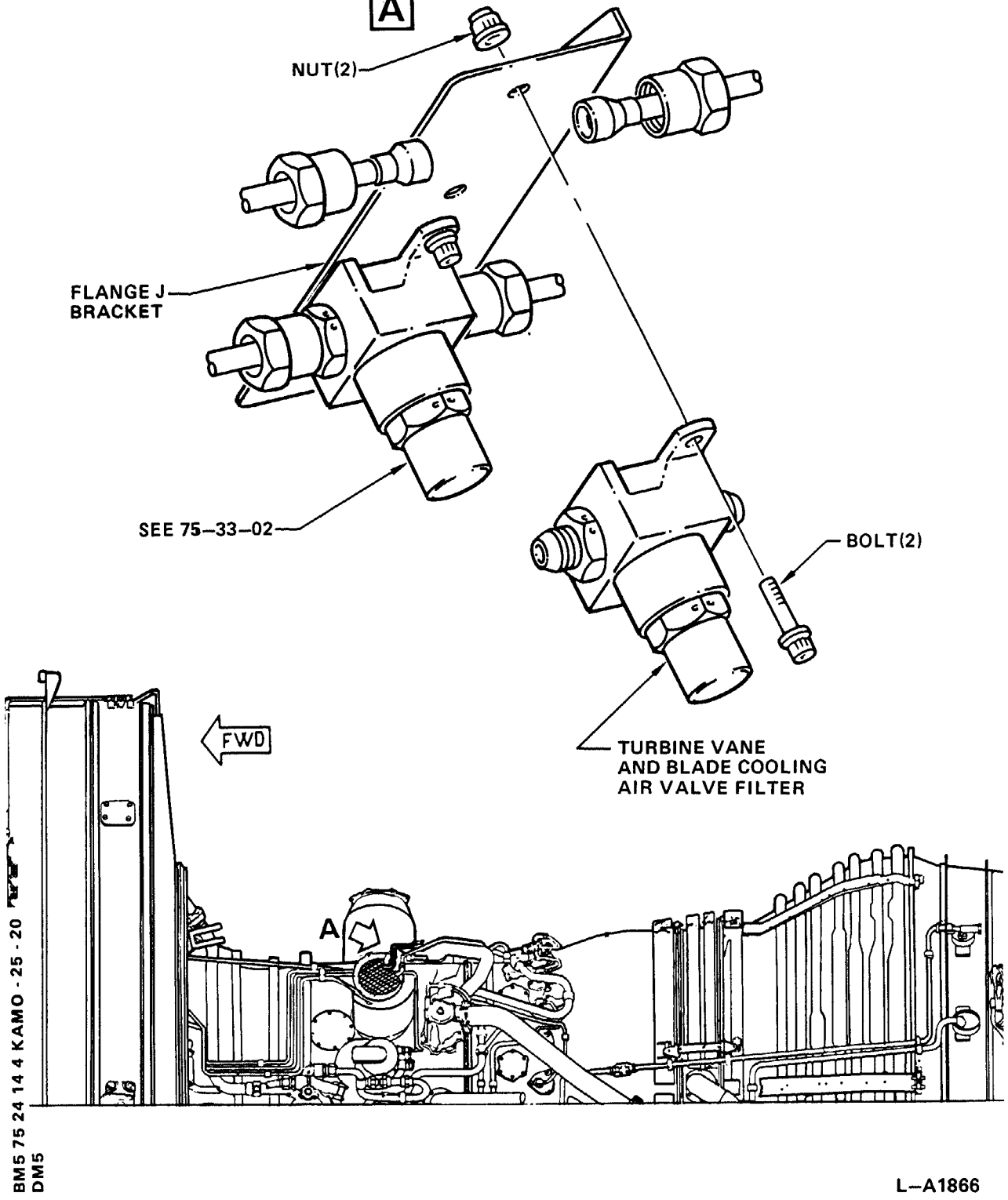
Post SB 71-2024 For A/C 101-105,

B. For Phase III Engine Configuration
(Ref. Fig. 404)

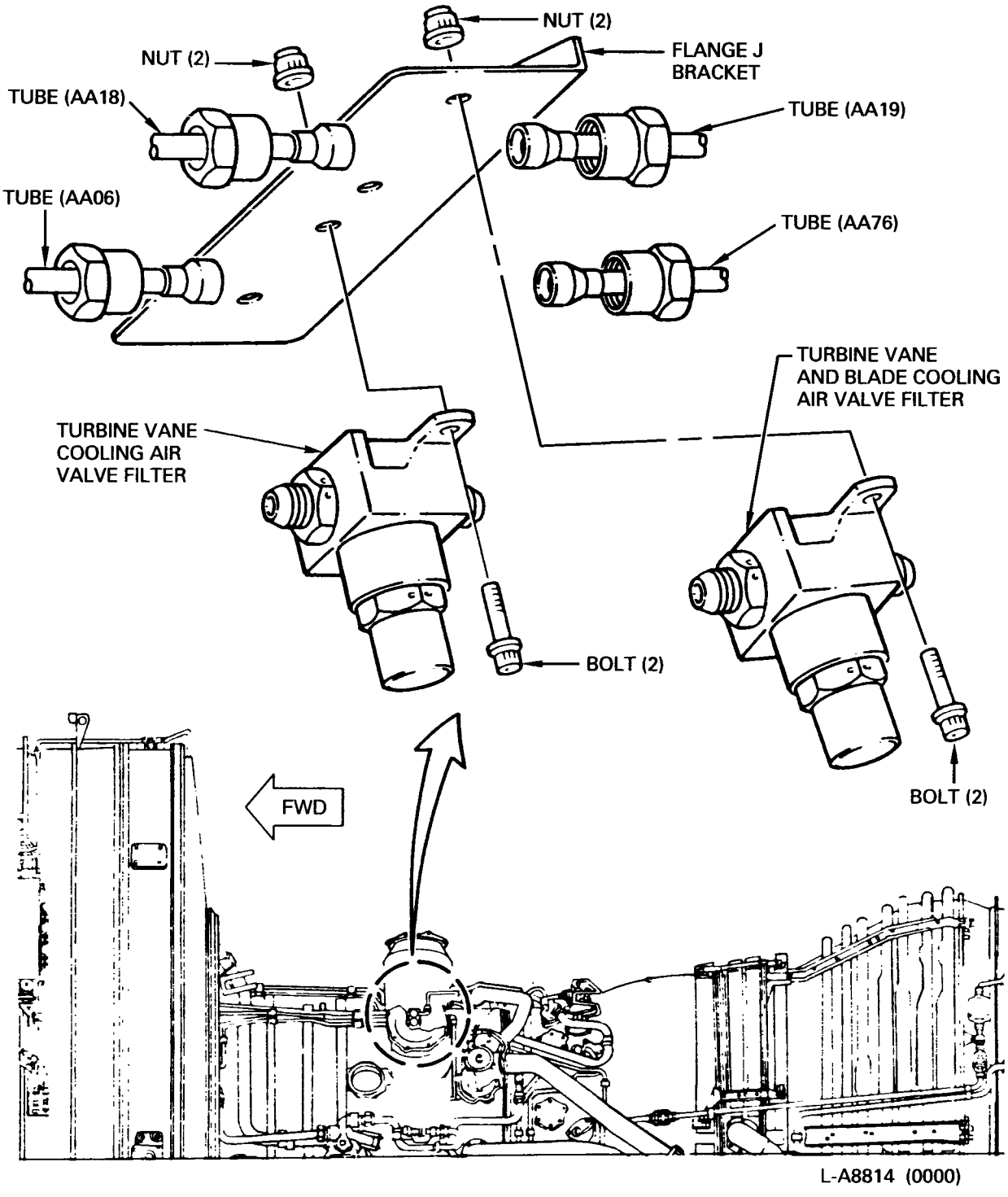
**ON A/C 101-200,

(1)Removal
(a)Remove lockwire and unscrew case from head assembly.
(b)Unscrew filter element from head assembly
(c)Install protective closure on head assembly.
(2)Installation
(a)Remove protective closure from head assembly.
(b)Screw filter element into head assembly.
Tighten filter element handtight.
(c)Install case and TORQUE to between 240 and 300 lbf.in.
(2.72 and 3.38 m.daN).
(d)Wirelock case to head assembly.
NOTE : Using corrosion resistant steel lockwire MS20995C32.

C. Close-Up



Turbine Vane and Blade Cooling Air Valve Filter
Figure 401



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Turbine Vane and Blade Cooling Air Valve Filter,
Turbine Vane Cooling Air Valve Filter (Sheet 1/2)
Figure 402

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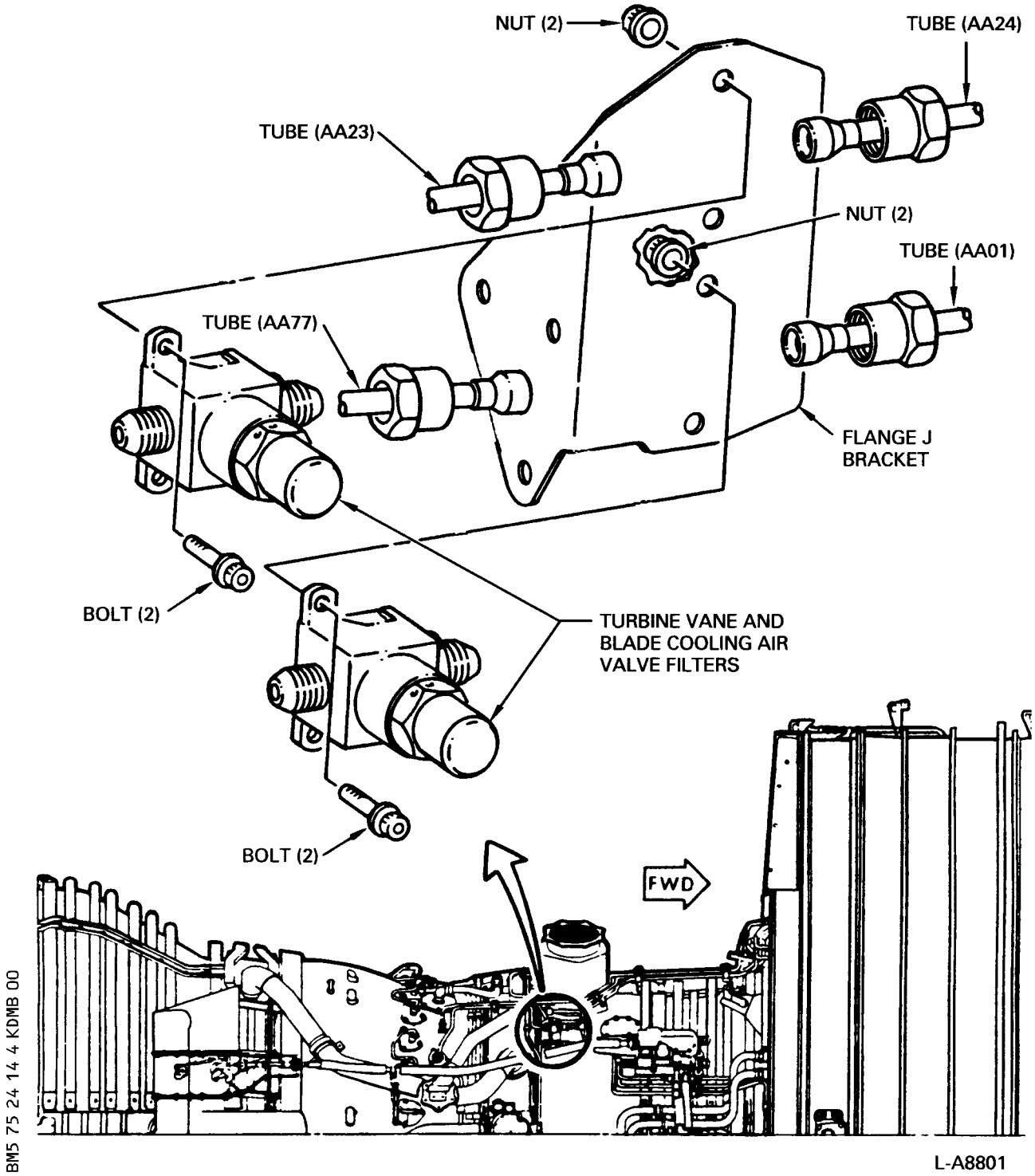

Turbine Vane and Blade Cooling Air Valve Filter (Sheet 2/2)
Figure 402

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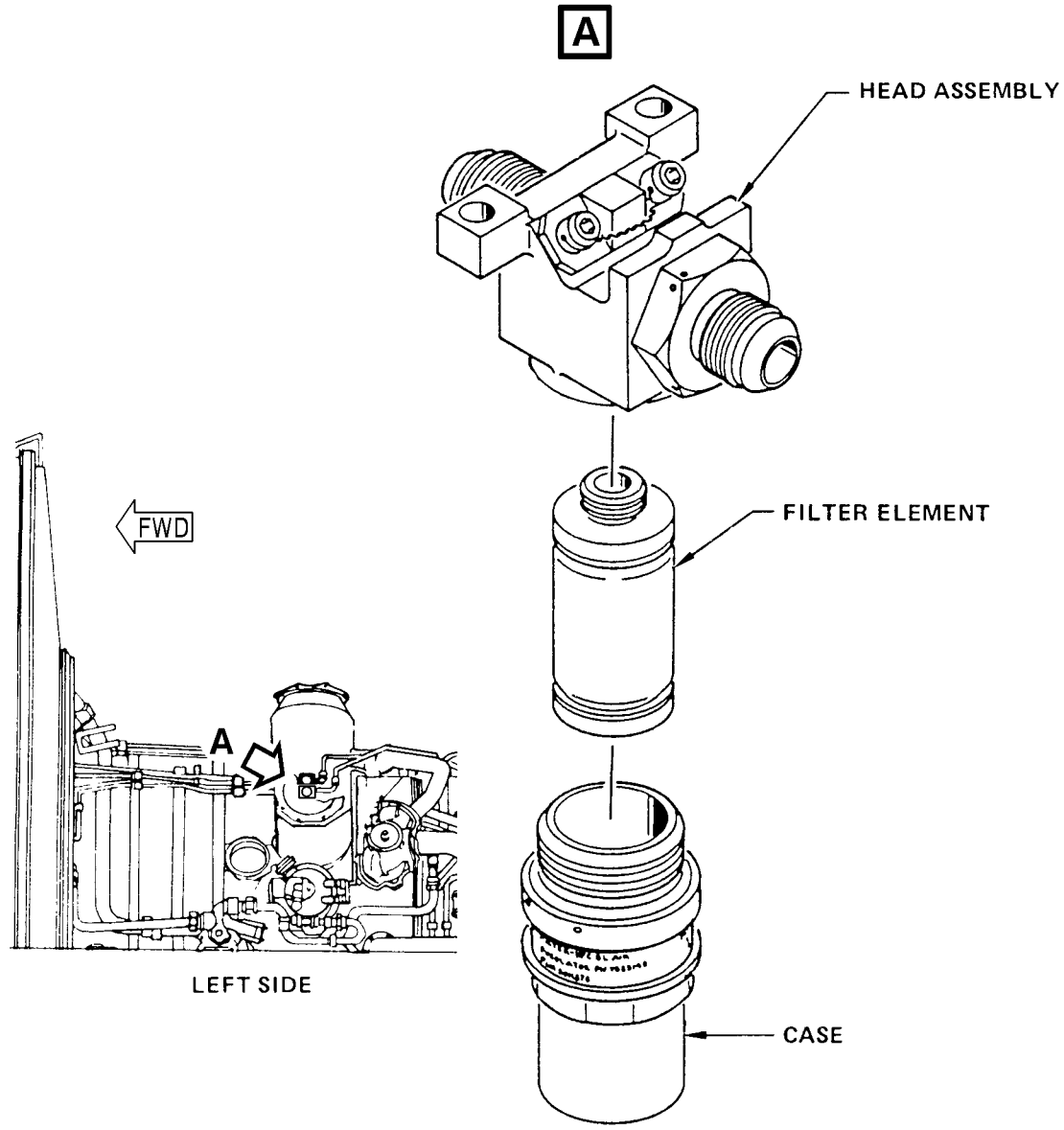
(1)Remove access platform.
(2)Close left thrust reverser and fan cowl doors, and remove safety clips and tags, and close circuit breakers (Ref. 71-13-00, P. Block 301).



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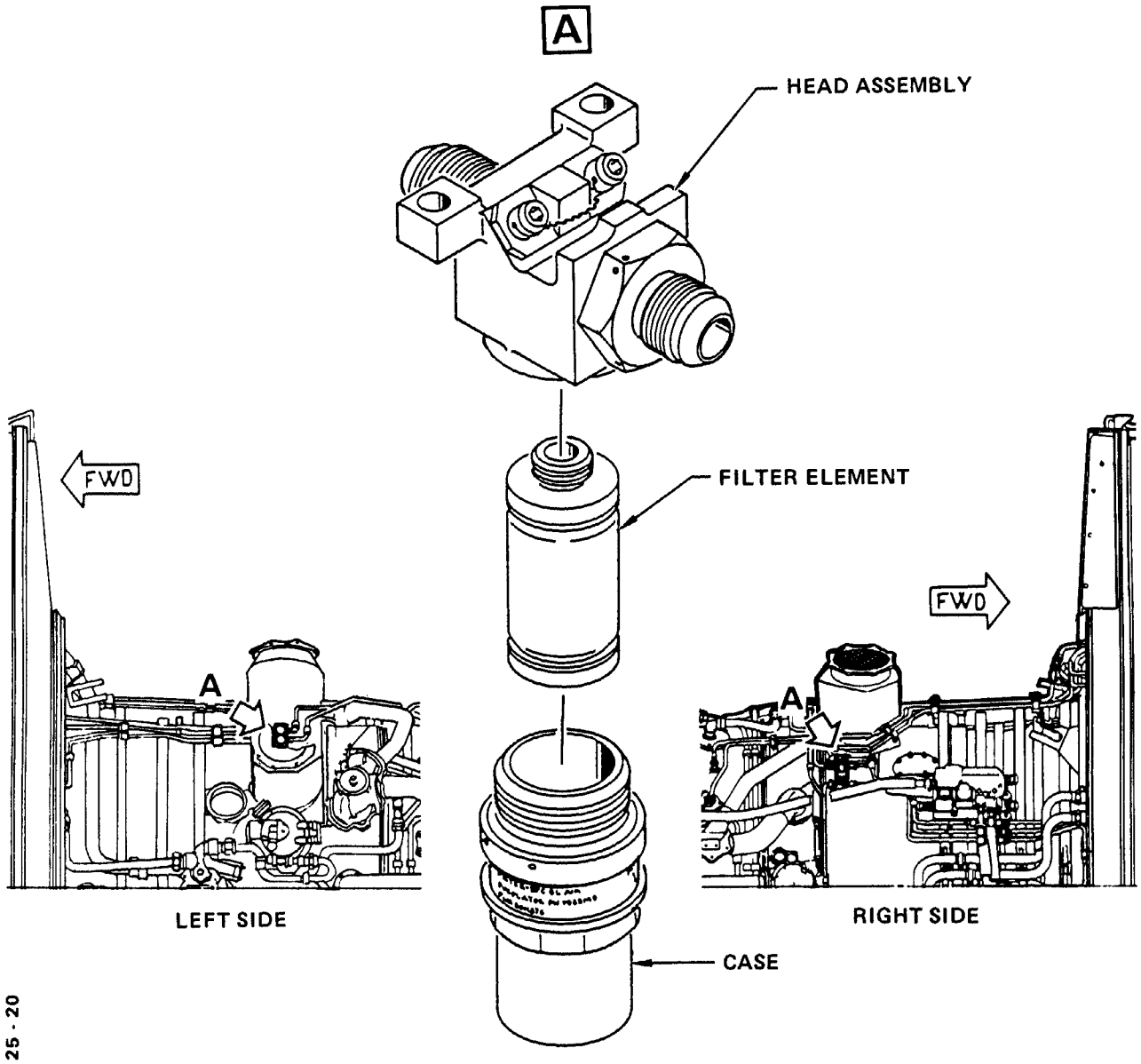
Turbine Vane and Blade Cooling Air Valve Filter Element
Figure 403



Turbine Vane and Blade Cooling Air Valve Filter Element
Figure 404

TURBINE VANE AND BLADE COOLING AIR VALVE FILTER - INSPECTION/CHECK

1. Equipment and Materials

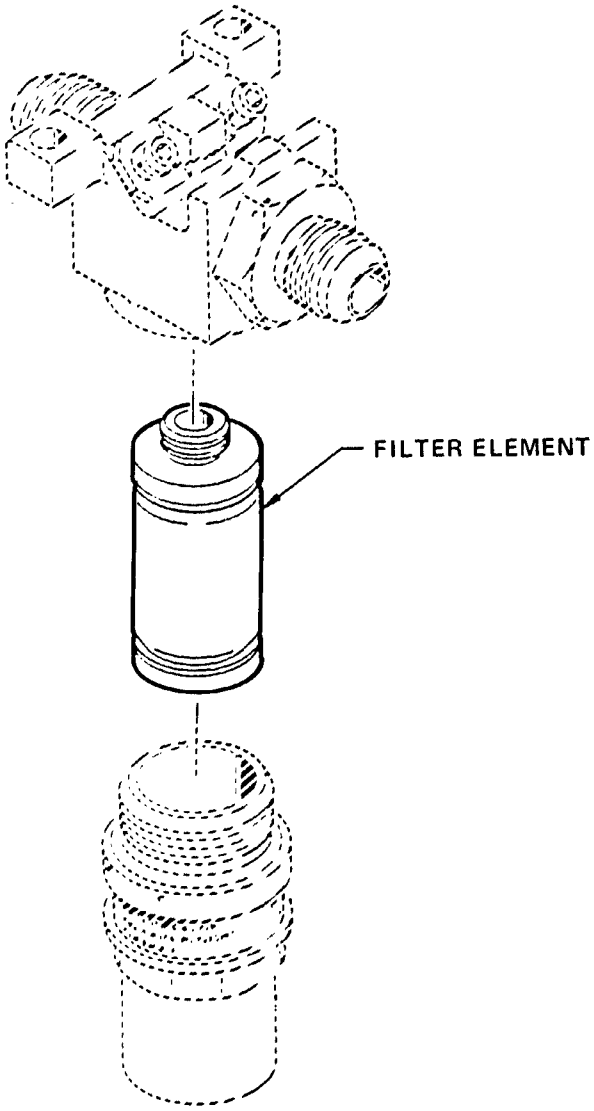
ITEM	DESIGNATION
Referenced Procedures	
- 75-24-14, P. Block 401	Turbine Vane and Blade Cooling Air Valve Filter
- 75-24-14, P. Block 701	Turbine Vane and Blade Cooling Air Valve Filter

2. Procedure

A. Job Set-Up
(1)Remove filter element (Ref. 75-24-14, P. Block 401).

B. Inspection (Ref. Fig. 601)
(1)Inspect filter element for evidence of an accumulation of contamination.
(2)Clean filter element (Ref. 75-24-14, P. Block 701).

C. Close-Up
(1)Install filter element (Ref. 75-24-14, P. Block 401).



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Turbine Vane and Blade Cooling Air Valve Filter Element
Figure 601

TURBINE VANE AND BLADE COOLING AIR VALVE FILTER CLEANING/PAINTING

1. Equipment and Materials

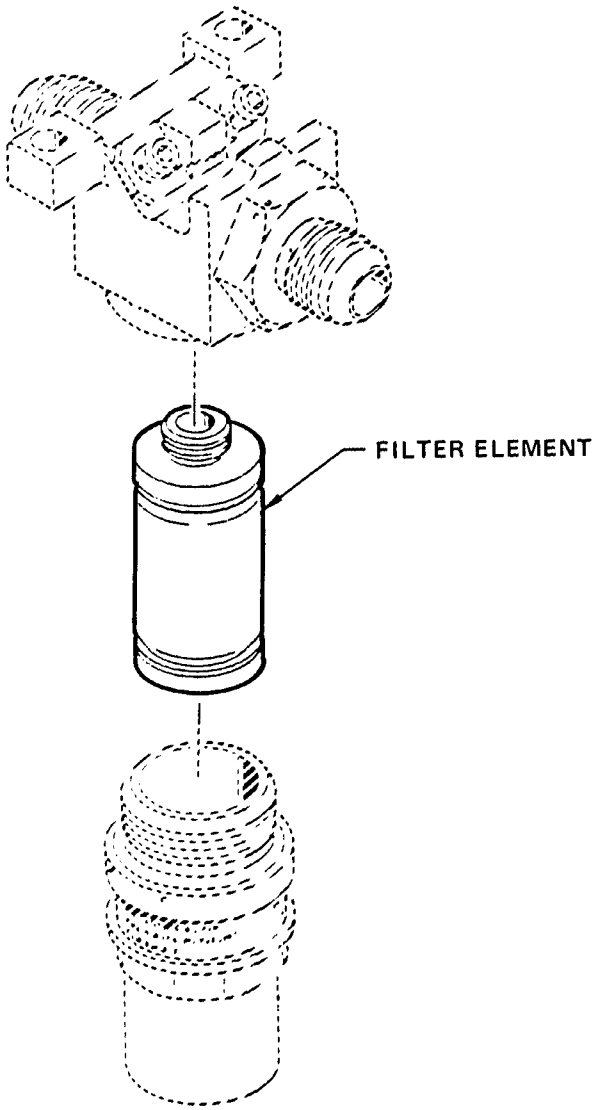
ITEM	DESIGNATION
A. Material No.P05-005	Special Materials (Ref. 70-00-00)
B. Material No.P05-058	Special Materials (Ref. 70-00-00)
C. Material No.P11-004	Cleaning Agents (Ref. 70-00-00)
Referenced Procedure	
- 75-24-14, P. Block 401	Turbine Vane and Blade Cooling Air Valve Filter

2. Procedure

A. Job Set-Up
(1)Remove filter element (Ref. 75-24-14, P. Block 401).

B. Cleaning (Ref. Fig. 701)
(1)Clean filter element with Material No.P11-004. Use Material No.P05-058 to remove stubborn accumulations of contamination.
(2)Dry filter element with Material No.P05-005 or filtered, moisture free compressed air at 20 psig (1.38 bar) maximum.
(3)Repeat cleaning procedure if any contaminants remain in filter element.
(4)If filter element remains contaminated after repeated cleaning, replace filter element.

C. Close-Up
(1)Install filter element (Ref. 75-24-14, P. Block 401).



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Turbine Blade and Vane Cooling Air Valve Filter
Figure 701

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

TURBINE VANE AND BLADE COOLING AIR VALVE, IDGS AIR/OIL HEAT EXCHANGER VALVE OVERRIDE SOLENOID - REMOVAL/INSTALLATION

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

NOTE : This procedure is available on aircraft equipped with PHASE III configured engines.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Gaskets
C.	Access Platform
D.	Torque Wrench
E.	Caps
F.	Protective Covers
G.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
H. Material No.P03-001	Oils (Ref. 70-00-00)
R J. Material No.P06-054	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

2. Procedure

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

A. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69

(2)Install access platform.
(3)Open right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(4)Install the fan exit liner segment (inner rear) that is at 10 o'clock (Ref. 72-23-05, P. Block 401).

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

B. Removal (Ref. Fig. 401)
(1)Disconnect the W1P10 and W1P11 harness connectors from the solenoid.
(2)Remove the lockwire from the two tube nuts on the rear of the solenoid and disconnect the tubes.
(3)Remove the lockwire from the pressure switch tube nuts. Disconnect and remove the tube. Install protective covers on the tube.
(4)Remove the four bolts that attach the solenoid and brackets to the intermediate case. Remove the bracket with the pressure switch. Remove the solenoid from under the loop clamp bracket and out of the intermediate case.
(5)If the solenoid must be replaced, do the following :
(a)Remove the two adapters and one plug from the rear of the solenoid.
(b)Remove the lockwire and remove the cap from the adapter on the top of the valve. Remove the two adapters from the top of the valve.
(c)Install protective covers to all openings on solenoid.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

C. Installation (Ref. Fig. 401)
(1)If a new solenoid must be installed, do the following :
(a)Remove protective covers from all the openings on the valve solenoid.
(b)Install two adapters with gaskets, threads lubricated with Material No.P03-001, to the two openings on top of the valve. TORQUE the

adapters to between 65 and 75 lbf.in. (0.74 and 0.84 m.daN).

(c)Install the cap, thread lubricated with Material No.P03-001, to the right adapter. TORQUE the cap to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN).

(d)Install the two adapters, larger adapter in center port, and the smaller adapter in the right port on the rear of the solenoid with gaskets, threads lubricated with Material No.P03-001. TORQUE the larger adapter to between 150 and 170 lbf.in. (1.70 and 1.92 m.daN) and the smaller adapter to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN).

(e)Install the plug with gasket, threads lubricated with Material No.P03-001, to the left port on the rear of the solenoid. TORQUE the plug to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN).

(2)Install the solenoid to the intermediate case and under the loop clamp bracket, at approximately the 1 o'clock position, with the two adapters rearward and the rear lugs on the solenoid rearward of the lugs on the case.

Install the switch and bracket assembly to the solenoid and install four bolts, threads lubricated with Material No.P03-001, to attach the brackets and solenoid to the intermediate case. TORQUE the bolt to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

R (3)Lubricate the threads of the adapter with Material No.P06-054 and install the supply tube nut to the center adapter on the rear of solenoid. TORQUE the tube nut to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN).

(4)Lubricate the lower rear adapter on the solenoid with Material No.P03-001, and install the air solenoid signal tube nut to the adapter. TORQUE the tube nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN) and wirelock the tubes and plug.

(5)Install the pressure switch tube assembly.

(a)Lubricate the threads at the elbow end of the tube with Material
R No.P03-001 and the threads at the straight end with Material No.P06-054 and install the tube to the engine.

(b)TORQUE the elbow end to the valve adapter to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN). TORQUE the straight end to the pressure switch to between 65 and 75 lbf.in. (0.74 and 0.84 m.daN).

Wirelock both ends of tube and cap.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

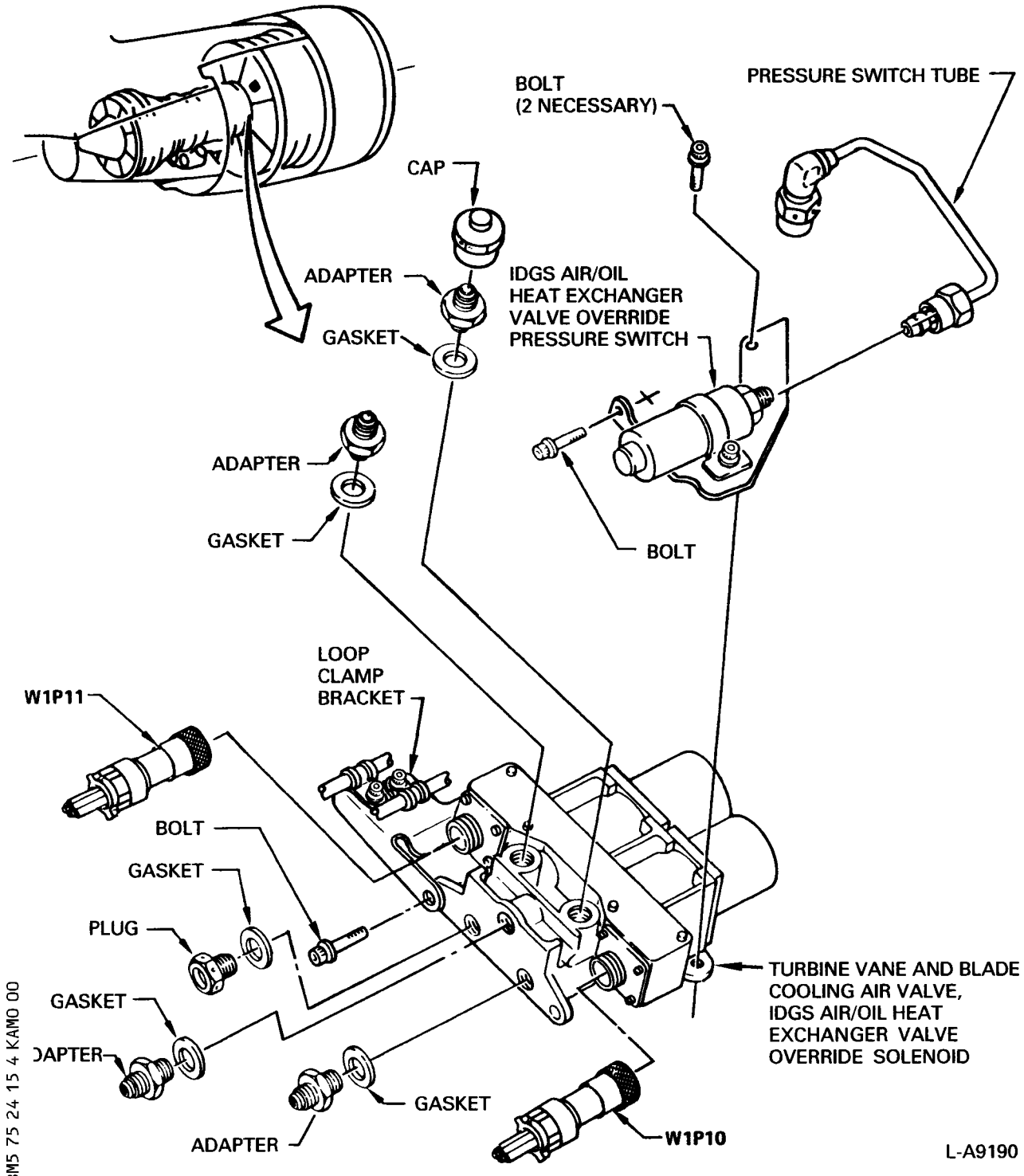
(6)Connect the W1P10 and W1P11 harness connectors to the solenoid.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

D. Close-Up and Test

(1)Install the fan exit liner segment (inner rear) that you removed (Ref. 72-23-05, P. Block 401).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close thrust reverser and left fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers : 19KS, 21KS, 18KS, 20KS.
(5)Remove access platform.
(6)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



Turbine Vane and Blade Cooling Air Valves, IDGS Air/Oil Heat Exchanger Valve Override Solenoid
Figure 401

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

TURBINE VANE COOLING AIR VALVE - REMOVAL/INSTALLATION

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

NOTE : This procedure is available on aircraft equipped with PHASE III configured engines.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Gaskets
C.	Access Platform
D.	Torque Wrench
E.	Protective Covers
F.	Corrosion Resistant Steel Lockwire
G. Material No.P03-001	Oils (Ref. 70-00-00)
H. Material No.P05-059	Special Materials
J. Material No.P06-038	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers, and open the left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install the access platform.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

B. Removal (Ref. Fig. 401)
(1)Remove the lockwire and disconnect the tube nut on the air signal supply tube (AA76) from the valve.
(2)Loosen and remove the bolts that attach the flange of the valve to the flange of the (upper) right turbine vane cooling air duct assembly (AP01).
(3)Remove the bolt and nut that attach the adjustable link rod end to the bracket that is attached to the valve flange.
(4)Remove the bolts that attach the valve flange and bracket to the HPC boss.
(5)Remove the turbine vane cooling air valve from the engine. Discard the gaskets.
(a)If the valve must be replaced, remove the tube adapter and gasket from the valve.
(6)Install protection covers to the duct, the tube and the valve pad.

R **ON A/C 101-105,

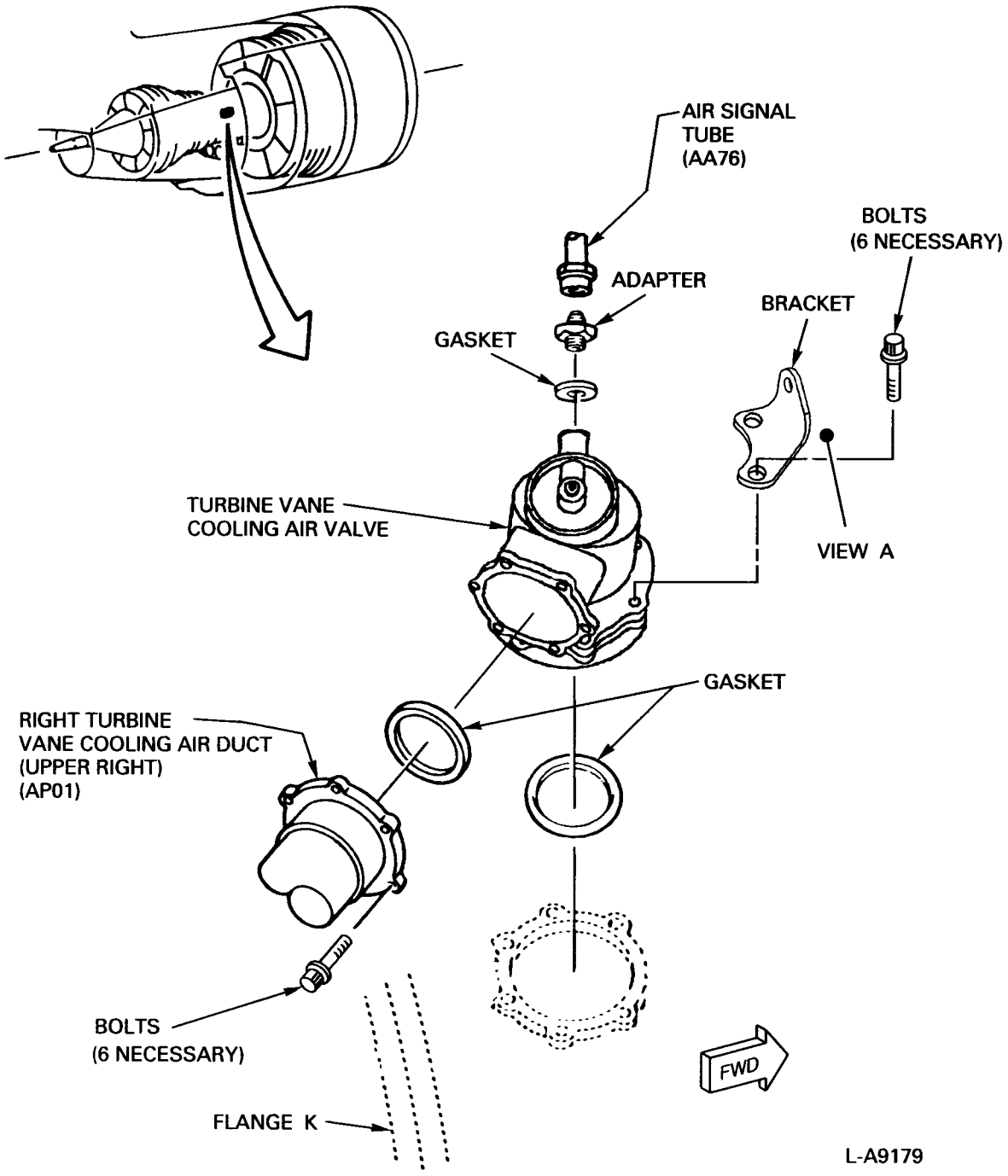
R Post SB 71-2024 For A/C 101-105,

C. Installation (Ref. Fig. 401)
(1)Remove the protective covers.
(2)If a new valve must be installed, do the following :
(a)Install a gasket to the tube adapter.
(b)Lubricate the adapter threads with Material No.P03-001 and install the adapter in the air supply (servo) port of the valve.
(c)TORQUE the adapter to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN).
(3)Install a new gasket to the boss on the HPC case located on the right side of the engine at approximately the 2:30 o'clock position. Attach the gasket to the case with Material No.P05-059.
(4)Install a new gasket to the flange of the (upper) right turbine vane cooling air duct (AP01). Hold the gasket in position with Material No.P05-059.
(5)Install the valve with a bracket to the boss and attach with bolts, threads lubricated with Material No.P03-001. TORQUE the bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN). TORQUE the bolts again until the specified torque is kept.
(6)Attach the flange of the (upper right) turbine vane cooling air duct (AP01) to the flange of the valve with bolts, threads lubricated with Material No.P03-001. TORQUE the bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN). Continue to torque the bolts until the specified torque is kept.
(7)Install the link rod end to the bracket that is attached to the valve flange. Attach the rod end to the bracket with a bolt, threads lubricated with Material No.P03-001 and a nut. TORQUE the bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(8)Lubricate the threads of the tube adapter with Material No.P06-038 and attach the air signal tube (AA76) to the adapter. TORQUE the tube nut to

between 200 and 225 lbf.in. (2.26 and 2.54 m.daN) and wirelock the tube nut.

D. Close-Up and Test

(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Remove the access platform.
(3) Close the right thrust reverser doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4) Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



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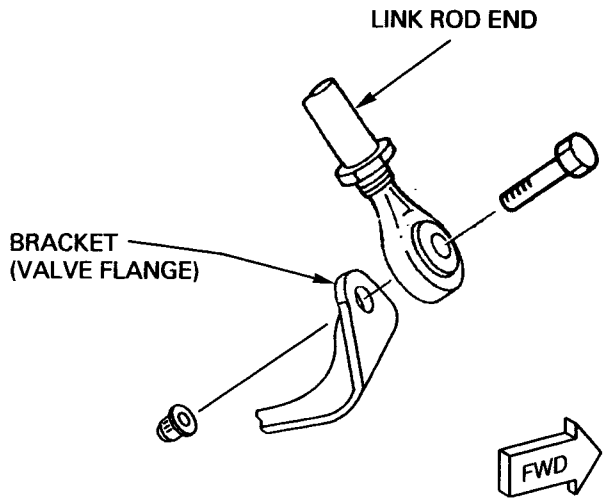
Turbine Vane Cooling Air Valve (Sheet 1/2)
Figure 401



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Turbine Vane Cooling Air Valve (Sheet 2/2)
Figure 401

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

TURBINE VANE COOLING AIR VALVE, TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID - REMOVAL/INSTALLATION

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

NOTE : This procedure is available on aircraft equipped with PHASE III configured engines.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Gaskets
C.	Access Platform
D.	Torque Wrench
E.	Caps
E.	Protective Covers
F.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
H. Material No.P03-001	Oils (Ref. 70-00-00)
R J. Material No.P06-054	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

2. Procedure

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

A. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69

(2)Install access platform.
(3)Open left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(4)Install the fan exit liner segment (inner rear) that is at 10 o'clock (Ref. 72-23-05, P. Block 401).

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

B. Removal (Ref. Fig. 401)
(1)Disconnect the W1P12 harness connector from the solenoid. Install protective covers on the harness and the solenoid connectors.
(2)Remove the lockwire from the three tube nuts on the rear of the valve solenoid and disconnect the tube nuts from the solenoid.
(3)Remove the four bolts that attach the solenoid and bracket to the case. Remove the solenoid from under the bracket and from the engine.
NOTE : If necessary, loosen the clamp bolt that attaches the tube to the bracket to gain clearance for the solenoid removal.
(4)If the solenoid must be replaced, do the following :
(a)Remove the three adapters and gaskets from the rear of the valve solenoid.
(b)Remove the lockwire and remove the two caps from the adapters on top of the valve. Remove the two adapters and gaskets from the top of the solenoid.
(c)Install protective covers to all the openings on the valve solenoid.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

C. Installation (Ref. Fig. 401)
(1)If new solenoid must be installed do the following :
(a)Remove the protective covers from all the openings on the solenoid.
(b)Install the two adapters with gaskets, threads lubricated with Material

No.P03-001, to the two openings on the top of the solenoid. TORQUE the adapters to between 65 and 75 lbf.in. (0.74 and 0.84 m.daN).

(c)Install the two caps, threads lubricated with Material No.P03-001, to the above adapters.
TORQUE the caps to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN) and wirelock the caps.

(d)Install three adapters, the larger adapter in the center, to the three ports on the rear of the solenoid with gaskets, threads lubricated with Material No.P03-001. TORQUE the center adapter to between 150 and 170 lbf.in. (1.70 and 1.92 m.daN) and the two outer adapters to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN).

(2)Install the solenoid to the intermediate case and the under bracket, at approximately the 10 o'clock position, with the three adapters rearward and the rear lugs on the valve solenoid rearward of the lugs on the case. Attach to the case with four bolts, threads lubricated with Material No.P03-001. TORQUE the bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).
NOTE : If the clamp bolt was loosened to get clearance for the solenoid removal, tighten and TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

R (3)Lubricate the threads of the adapter with Material No.P06-054 and install the supply tube assembly to the center adapter on the rear of the solenoid.
TORQUE the tube nut to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN).

(4)Lubricate the upper rear adapter on the valve solenoid with Material No.P03-001, and install the signal tube assembly to the adapter.
TORQUE the tube nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).

(5)Lubricate the lower rear adapter on the valve solenoid with Material No.P03-001, and install the signal tube assembly to the adapter. TORQUE the tube nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).

(6)Wirelock the above three tube nuts.
CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(7)Connect the W1P12 harness connector to the solenoid (Ref. 70-00-00, P. Block 201).

**ON A/C 101-105,

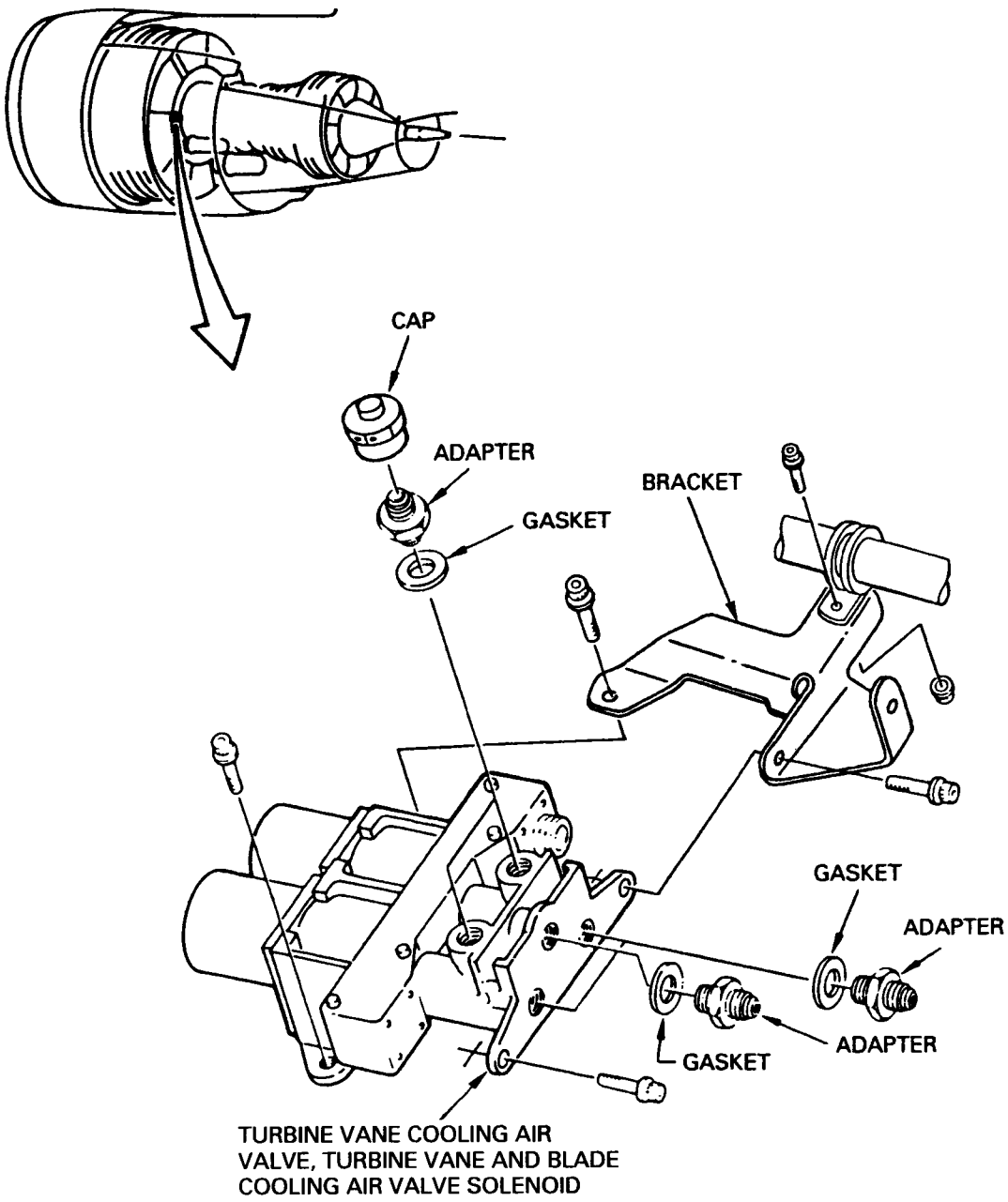
Post SB 71-2024 For A/C 101-105,

D. Close-Up and Test

(1)Install the fan exit liner segment (inner rear) that you removed (Ref. 72-23-05, P. Block 401).

(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(3)Close thrust reverser and left fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers : 19KS, 21KS, 18KS, 20KS.
(5)Remove access platform.
(6)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



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Turbine Vane Cooling Air Valve, Turbine Vane and
Blade Cooling Air Valve Solenoid
Figure 401

NACELLE CORE COMPARTMENT COOLING
DESCRIPTION AND OPERATION

NOTE : There are two types of nacelle cooling systems, one uses spray bar cooling and is installed on Conf-01 engines and the other uses poppet valve cooling and is installed on Conf-02 engines.

1. Nacelle Core Compartment Cooling System - Spray Bar Configuration - Conf-01 Engine

A. Description (Ref. Fig. 001, 002)

(1)The spray bar nacelle core compartment cooling system is accomplished through an axial spray bar ventilation system. This system includes two perforated cooling air ducts (spray bars), one mounted on each side of the fan reverser compartment, which distribute engine fan air throughout the engine core compartment.

(2)The intake to the left hand spray bar is an offtake of the precooler duct. The right hand side has a dedicated intake in the upper quadrant of the thrust reverser inner barrel. A pneumatic-actuated, solenoid-operated butterfly shutoff valve (shutoff valve) controls the supply of engine fan air to each spray bar. The shutoff valve is spring-loaded in the closed position. Pneumatic pressure to open the valve is supplied by 15th stage engine bleed air when a barometric switch mounted on the fan case energizes the shutoff valve solenoid. The valve opens and allows
R cooling at all altitudes below 25,000 feet (7,620 m) and closes above
R 25,000 feet (7,620 m).
R NOTE : Circuit breakers 1KU and 2KU (Nacelle Cooling Power) are not
R installed or not used if installed.
R If they are installed, they must stay open and safetied.

B. Operation (Ref. Fig. 003)

(1)The pneumatic-actuated, solenoid-operated, butterfly shutoff valve (shutoff valve) is closed prior to engine start-up. When electrical power is supplied, the solenoid is energized by the barometric switch. Pneumatic power is supplied when the engine starts and the valve opens. Axial spray bar cooling is operative as long as the shutoff valve remains in the open position.

(2)The axial spray bar cooling system operates during takeoff and ascent. Spray bar cooling is terminated when power to the shutoff valve solenoid is interrupted by the action of the barometric switch. The barometric switch is set to interrupt electrical power to the shutoff valve solenoid as the aircraft climbs to increasing altitudes of 24,000 to 26,000 feet (7,315.2 to 7,924.8 m). During descent, the barometric switch reinstates the power supply to the shutoff valve
R solenoid at 1,000 to 3,000 feet (304,8 to 914,4 m) (nominal) below the actuating point of the climb. Accordingly, the axial spray bar cooling is operative during descent and landing, and shuts off landing, and shuts off upon engine shutdown.

(3)All electrical power to the axial spray bar cooling system for valve

position control and valve failure indication is routed through the fire handle interlock supplied by the airframe. Before engine start-up, a cockpit failure indicator signals any valve position other than fully closed (Ref. Fig. 004).

2. Nacelle Core Compartment Cooling System - Poppet Valve Configuration - Conf -02 Engine

A. Description

(1) The poppet valve nacelle cooling system includes two muscle-assisted poppet valves, with associated muscle lines, and a solenoid operated pneumatic control valve (control valve) on each thrust reverser door. The function of the nacelle cooling system is to cool the engine accessories by distributing engine fan air throughout the core compartment.

(2) Muscle lines are routed from the control valve at the upper track area of the inner barrel, along the inner barrel to two poppet valves installed on each side of the thrust reverser (Ref. Fig. 005). The poppet valves are located on the inner surface of each thrust reverser door and penetrate the thrust reverser inner barrel structure.

(3) A barometric switch is mounted on the engine fan case and includes an evacuated aneroid and snap switch. The barometric switch provides a 28 Vdc control signal to the control valve. In the event of diaphram rupture, the aneroid causes the valve to close.

R NOTE : Circuit breakers 1KU and 2KU (Nacelle Cooling Power) are not
R installed or not used if installed.
R If they are installed, they must stay open and safetied.

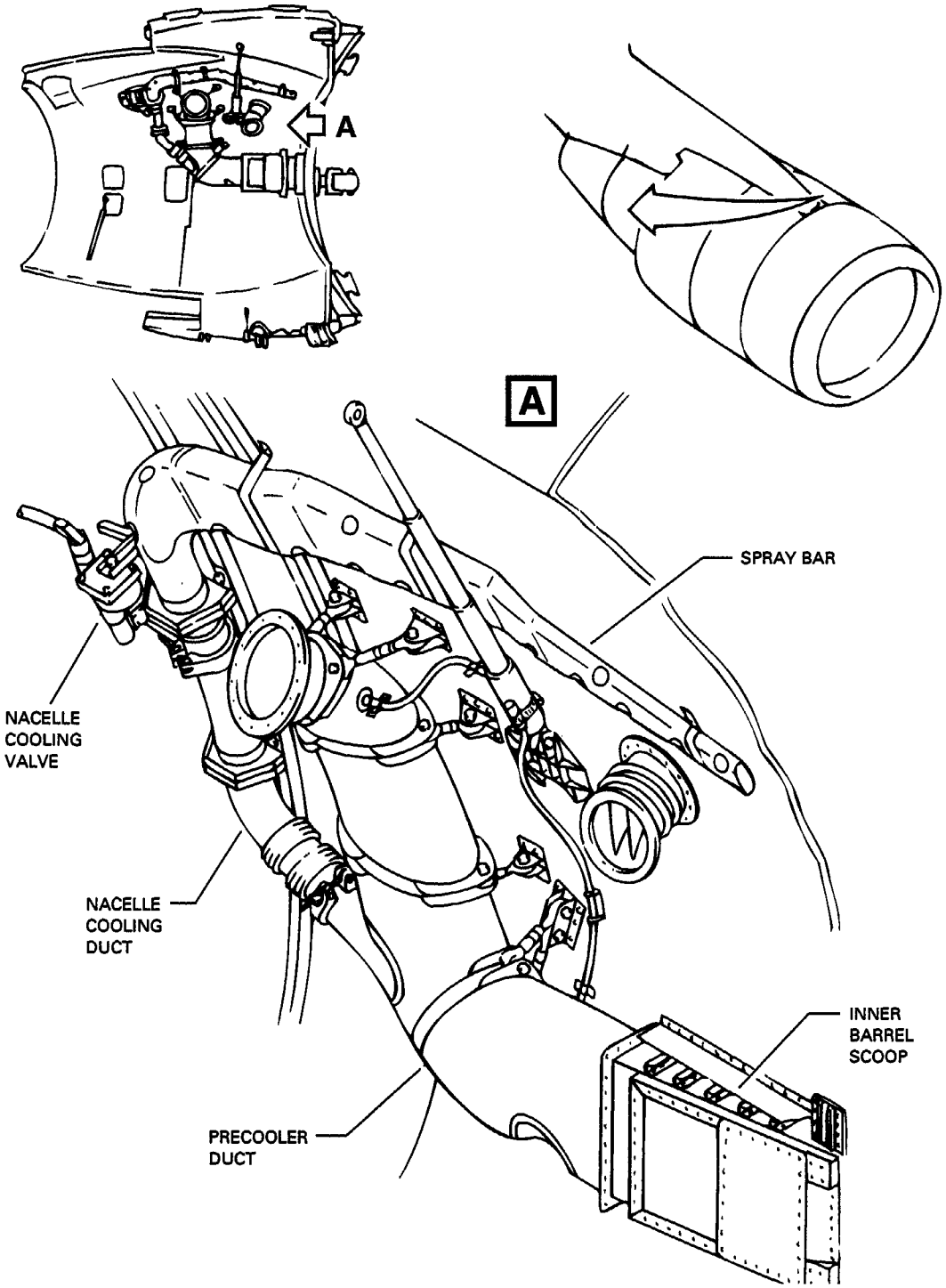
B. Operation (Ref. Fig. 006)

(1) The solenoid-operated control valve (control valve) is open to provide muscle line pressure to the poppet valves during takeoff, climb, and descent. The control valve solenoid is energized at altitudes below 25,000 feet (7,620 m). Above 25,000 feet (7,620 m), the barometric pressure switch opens, de-energizing the control valve solenoid. The control valve then closes and remains closed during cruise. The control valve also remains closed during engine shutdown to allow for proper fire extinguishing concentration in the event of a fire.

(2) The control valve controls engine bleed air to provide muscle pressure to the poppet valves. When the control valve solenoid is energized, muscle pressure is provided to the poppet valves via hard lines. The control valve solenoid is energized at altitudes below 25,000 feet. Above 25,000 feet the barometric pressure switch opens, de-energizing the solenoid.

(3) The poppet valves operate in an unassisted passive mode when the control valve is closed. In this mode the poppet valves are operated by fan duct pressure. The fan duct pressure required to overcome the spring force of the poppet valves is 5.5 psi (37.9 kPa).

(4) When both half thrust reverser cowl doors are in poppet valve configuration, the **NAC COOL VALVE OPEN** annunciator light although operational, is not used to indicate that one or both valves have remained open at engine shutdown. This annunciator light is operational to allow a total intermix with spray bar configuration.



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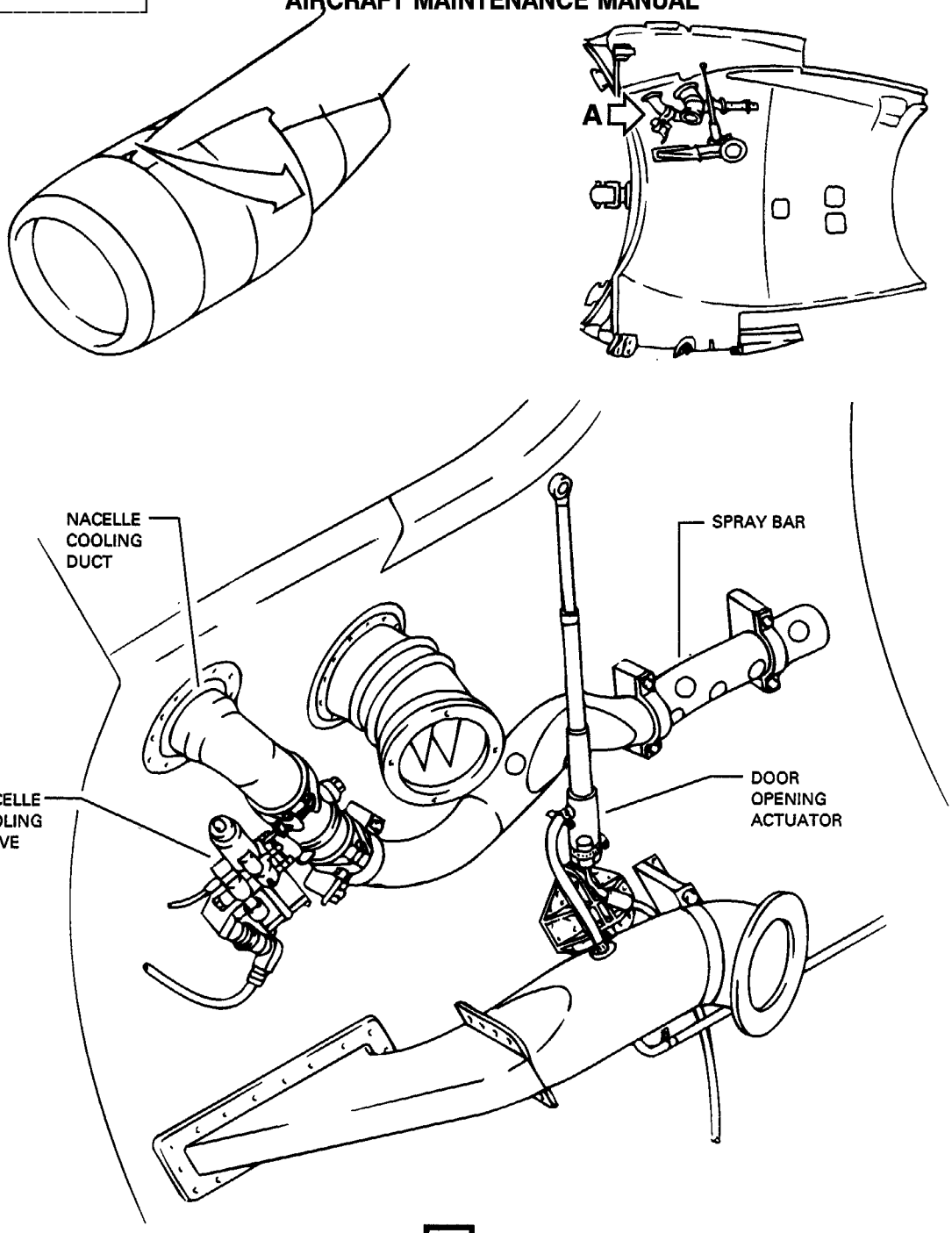
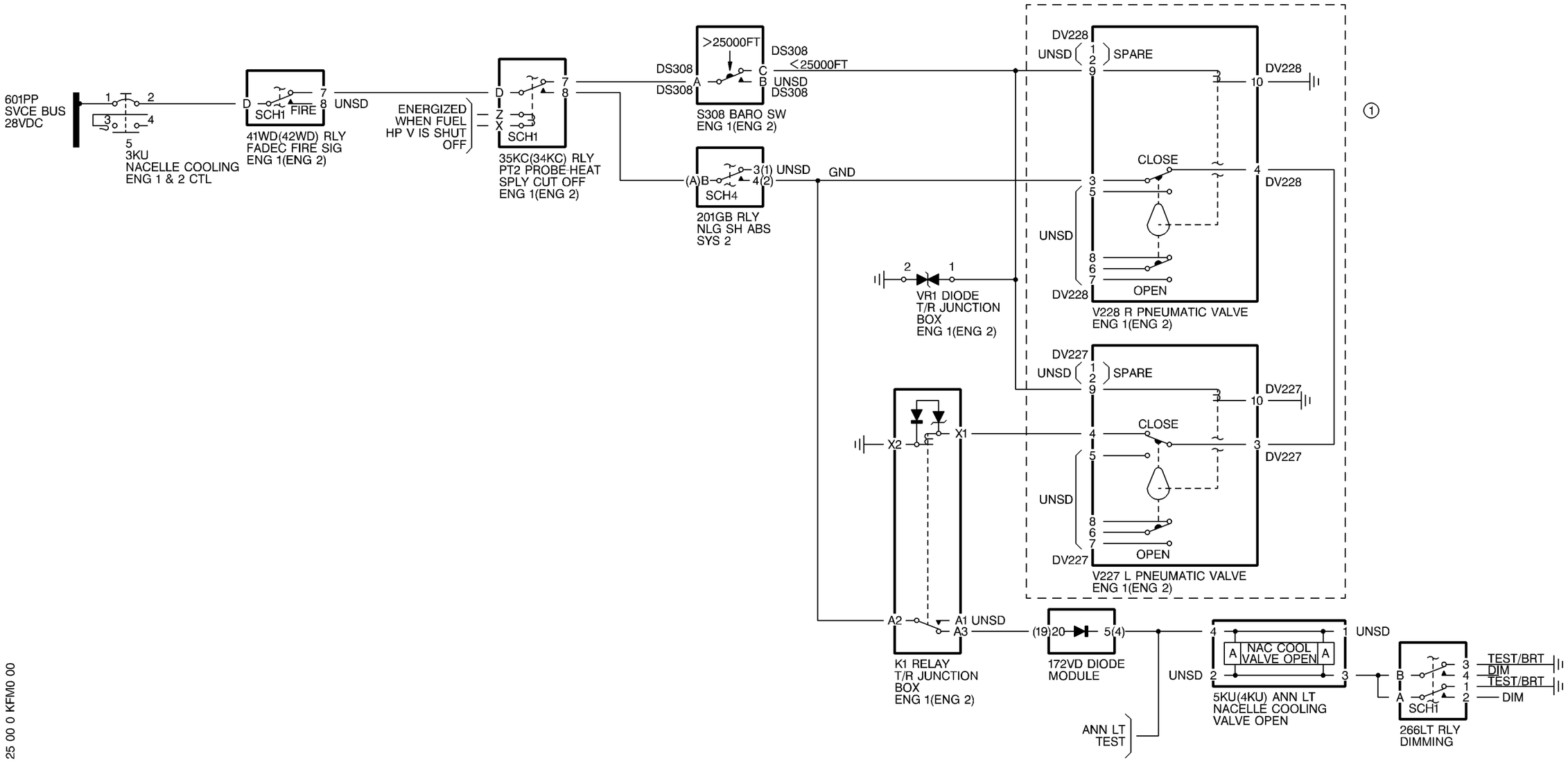
Nacelle Core Compartment Cooling - Left Hand
Figure 001



Nacelle Core Compartment Cooling - Right Hand
Figure 002



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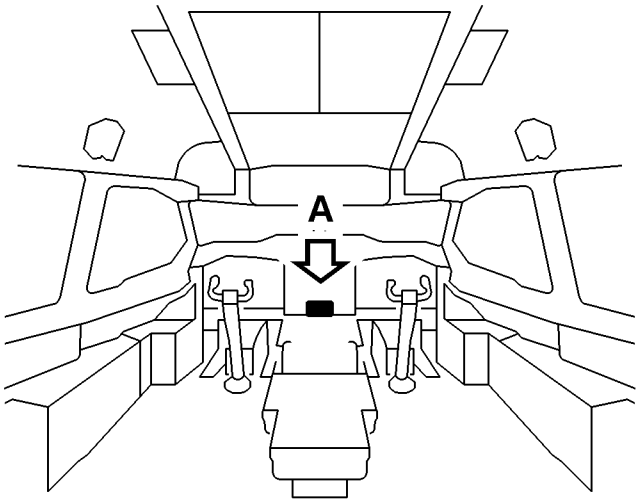
Spray Bar Configuration - Electrical Circuit
Figure 003



A

FUEL CLOG	NAC COOL VALVE OPEN	NAC COOL VALVE OPEN	FUEL CLOG
OIL LO PRESS	OIL CLOG	OIL CLOG	OIL LO PRESS

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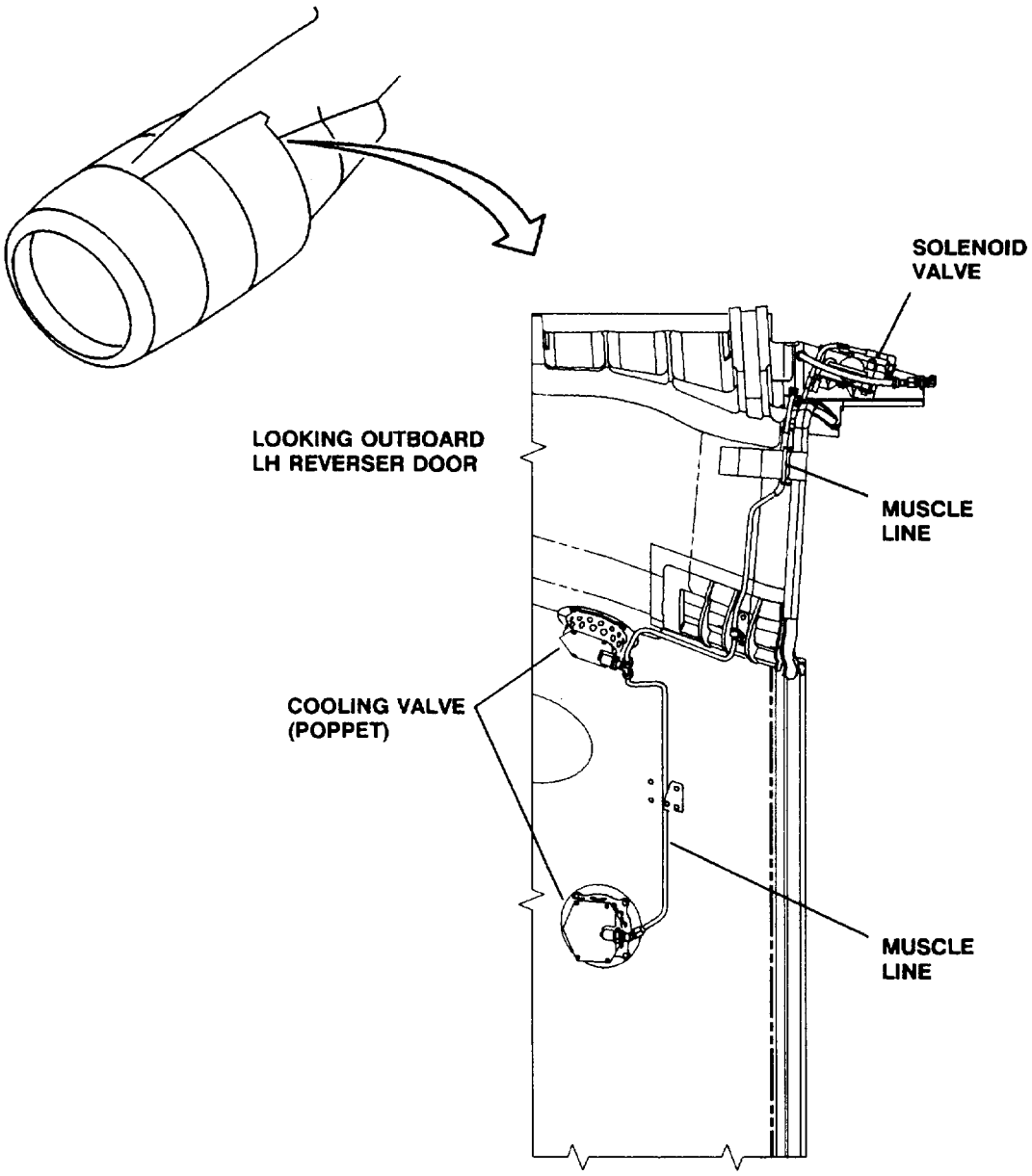
Indicating
Figure 004



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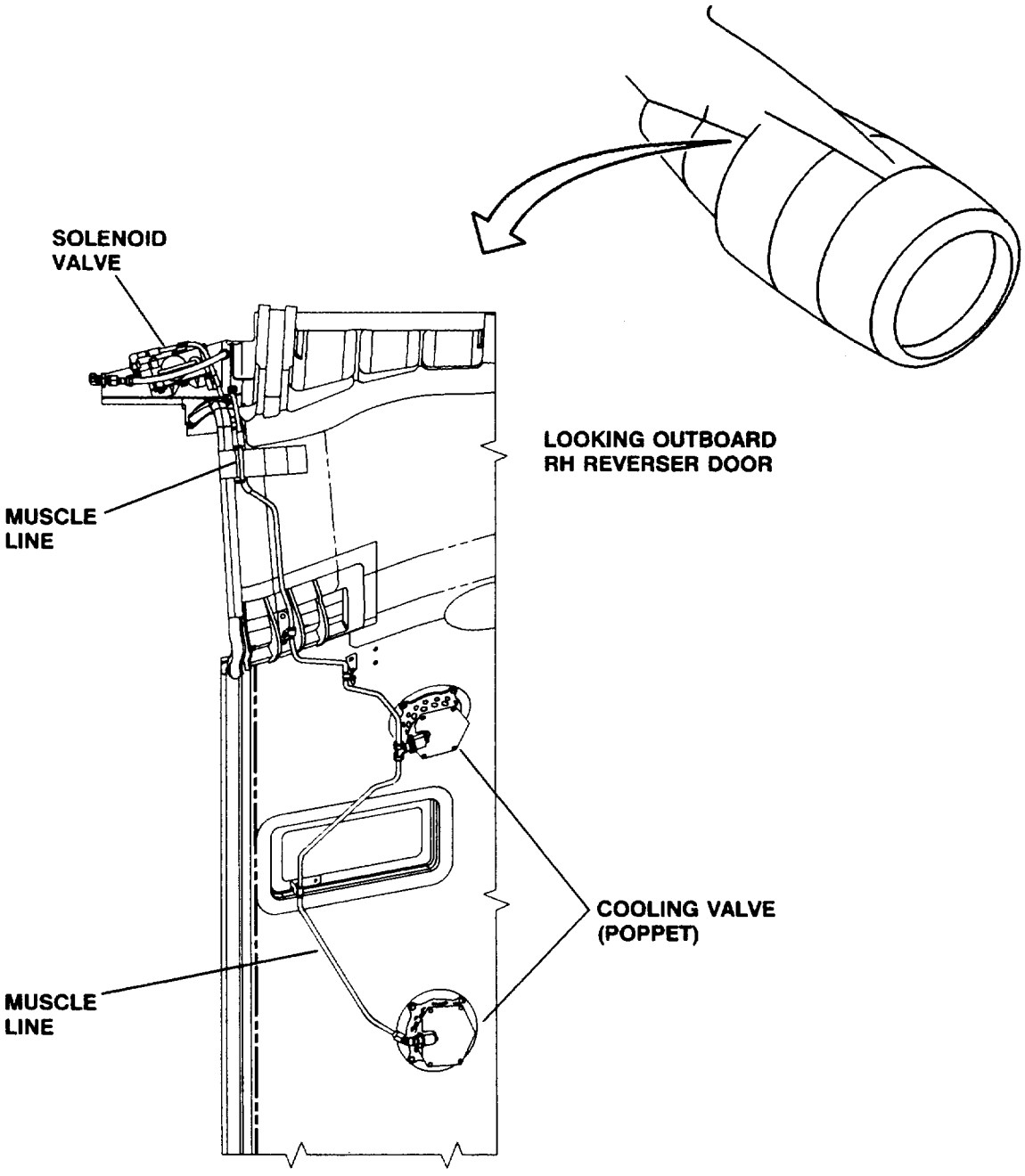
Nacelle Cooling System - Poppet Valve Configuration - LH Reverser Door (Sheet 1/2)
Figure 005



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Nacelle Cooling System - Poppet Valve Configuration - RH Reverser Door (Sheet 2/2)
Figure 005

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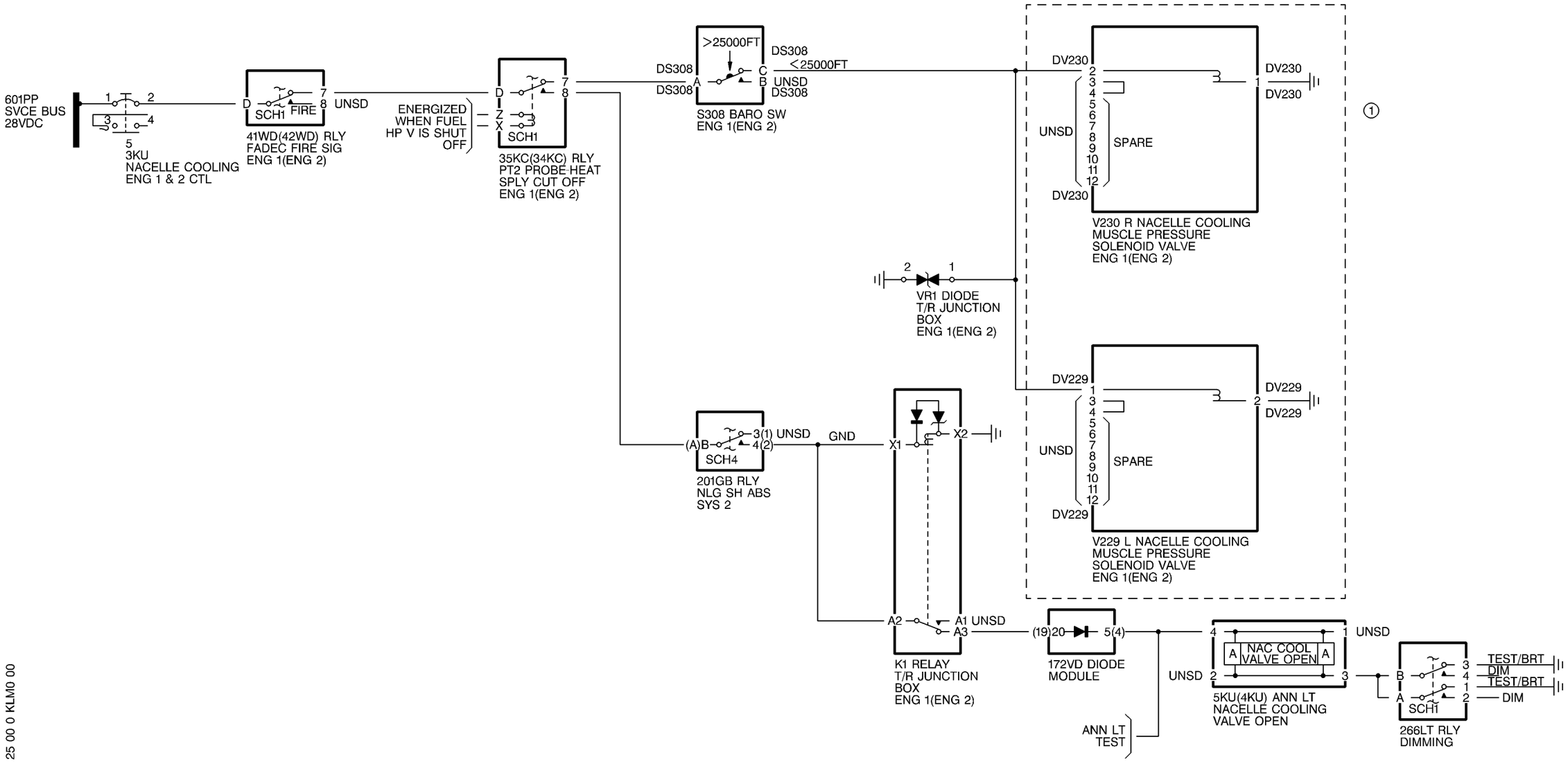

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Poppet Valves Configuration - Electrical Circuit
Figure 006

NACELLE CORE COMPARTMENT COOLING SYSTEM - ADJUSTMENT/TEST

R

1. General

A. This procedure provides instructions to accomplish a functional test of the left and right nacelle core compartment cooling system valves.

2. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Vacuum Pump (0.25 in.Hg (0-1 bars))
C.	Push-Pull Gage, 0-100 lbs (0-444.82N)
D.	Regulated Air Pressure Supply (20 - 100 psi (137.9 - 689.5 kPa))
Referenced Procedures	
- 24-41-00, P. Block 301	AC External Power Control
- 71-13-00, P. Block 301	Cowl Doors

3. Actuation Test - Left and Right Thrust Reverser Nacelle Cooling System Valves (Spray Bar Configuration)

NOTE : For intermix configuration with one Thrust Reverser half cowl in spray bar configuration and the other half in poppet valves configuration, refer to paragraph 4. for poppet valves configuration.

(Ref. Fig. 501) (Sheets 1/4 and 2/4).

A. Job Set-Up

(1)Open fan cowl and thrust reverser doors (Ref. 71-13-00, P. Block 301).

(2)Prepare the Power Plant for functional test.

(a)Set HP fuel valve switch to OFF position.

(b)Make certain the following circuit breakers are closed :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG1/FUEL HP VALVE/CTL	3KC	333/T69
133VU	ENGINES/ENG2/FUEL HP VALVE/CTL	4KC	333/T70
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75
133VU	HYDRAULIC - L/G PROX DET AND RELAYS SYS 2 FLT/GND	1GB	331/V52
22VU	ENG FIRE DET-ENG1 LOOP A	1WD	209/A19
22VU	ENG FIRE DET-ENG2 LOOP A	2WD	209/A24

(c)Check that fire handle is in original (disarm) position.

(d)Remove tee fitting (2).

NOTE : The tee fitting (2) must be removed so that air pressure can be diverted through the nacelle cooling muscle pneumatic line (1).

1 Loosen the master actuator diffuser tube coupling nuts (3) from the tee fitting (2).

2 Loosen the nacelle cooling muscle line coupling nut (5) from the bottom of the tee fitting.
3 Remove the tee fitting (2).
4 Install protective covers on the ends of the master actuator diffuser tube coupling nuts (3).

(e) Connect air pressure source (20 - 100 psi) to nacelle cooling muscle pneumatic line (1).
(f) TORQUE coupling nut (5) to between 300 and 315 lbf.in. (3.39 and 3.55 m.daN).
(g) Connect vacuum pump to pressure port fitting of barometric sense switch (4).
NOTE : The pressure port fitting, MS33656E4, has .4375-20 UNJF-3A threads.

(3) Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).

B. Test Valve Operation
(1) Set HP fuel valve switch to ON position while air source is supplying 25 to 30 psi (172.4 to 206.8 kPa) air pressure.
Verify that both left and right nacelle cooling valves (6) open.
(2) Apply vacuum to the pressure port of the barometric sense switch (4) to get a pressure of 10.6-11.6 in.Hg (270-295 mm.Hg). Verify that both left and right nacelle cooling valves (6) close.
(3) Remove vacuum and verify that both left and right nacelle cooling valves (6) open.
(4) Pull fire handle in flight compartment.
Verify that both left and right nacelle cooling valves (6) close.
(5) Return fire handle to original (disarm) position.
Verify that both left and right nacelle cooling valves (6) open.

C. Test Fault Indicator
(1) Set HP fuel valve switch to OFF position. On 4VU observe momentary fault indication until both left and right nacelle cooling valves reach closed position, then observe that fault indication goes off.
(2) Remove air supply source.
(3) Install tee fitting (2).
(a) Remove protective covers from ends of master actuator diffuser tubes.
(b) Connect master diffuser tube coupling nuts (3) to tee fitting (2). Tighten finger tight.
(c) Connect the muscle line coupling nut (5) to the bottom of the tee fitting (2). TORQUE coupling nut to between 300 and 315 lbf.in. (3.39 and 3.55 m.daN).
(d) TORQUE coupling nuts to between 300 and 315 lbf.in. (3.39 and 3.55 m.daN).
(4) Manually open left and right nacelle cooling valves, one at a time, and observe fault indication.
(5) Remove vacuum pump fitting from barometric sense switch (4).

D. Close-Up
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Close thrust reverser and fan cowl doors. Remove safety clips and tags

and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)De-energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).

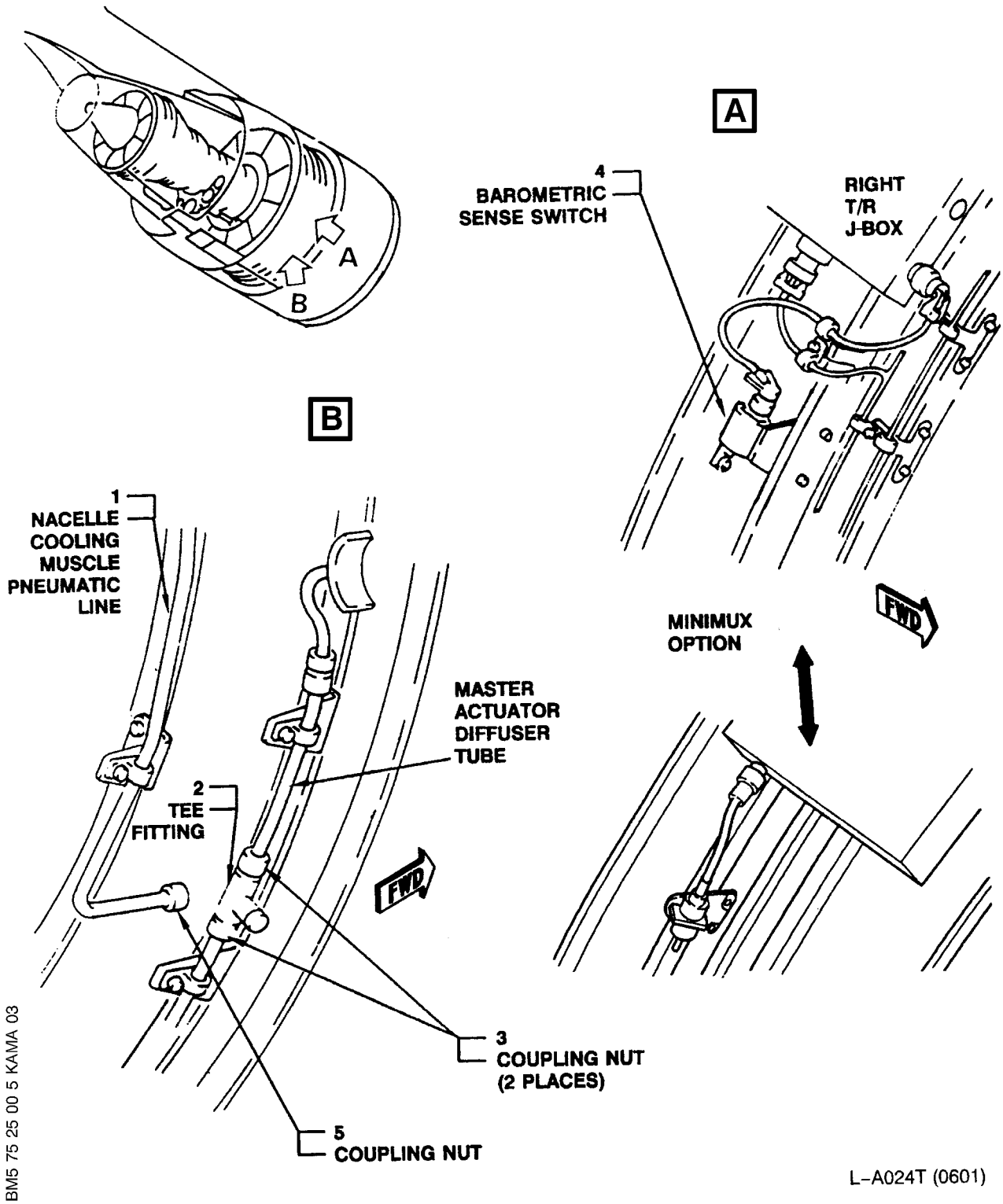
4. Actuation Test - Left and Right Thrust Reverser Nacelle Cooling System Valves (Poppet Valve Configuration)
(Ref. Fig. 501) (Sheets 1/4, 3/4 and 4/4).
NOTE : For intermix configuration with one Thrust Reverser half cowl in
R poppet valves configuration and the other half in spray bar
R configuration, refer to paragraph 3. for spray bar configuration.

A. Job Set-Up
(1)Open fan cowl and thrust reverser doors (Ref. 71-13-00, P. Block 301).
(2)Prepare the Power Plant for functional test.
(a)Set HP fuel valve switch to OFF position.
(b)Make certain that the following circuit breakers are closed:

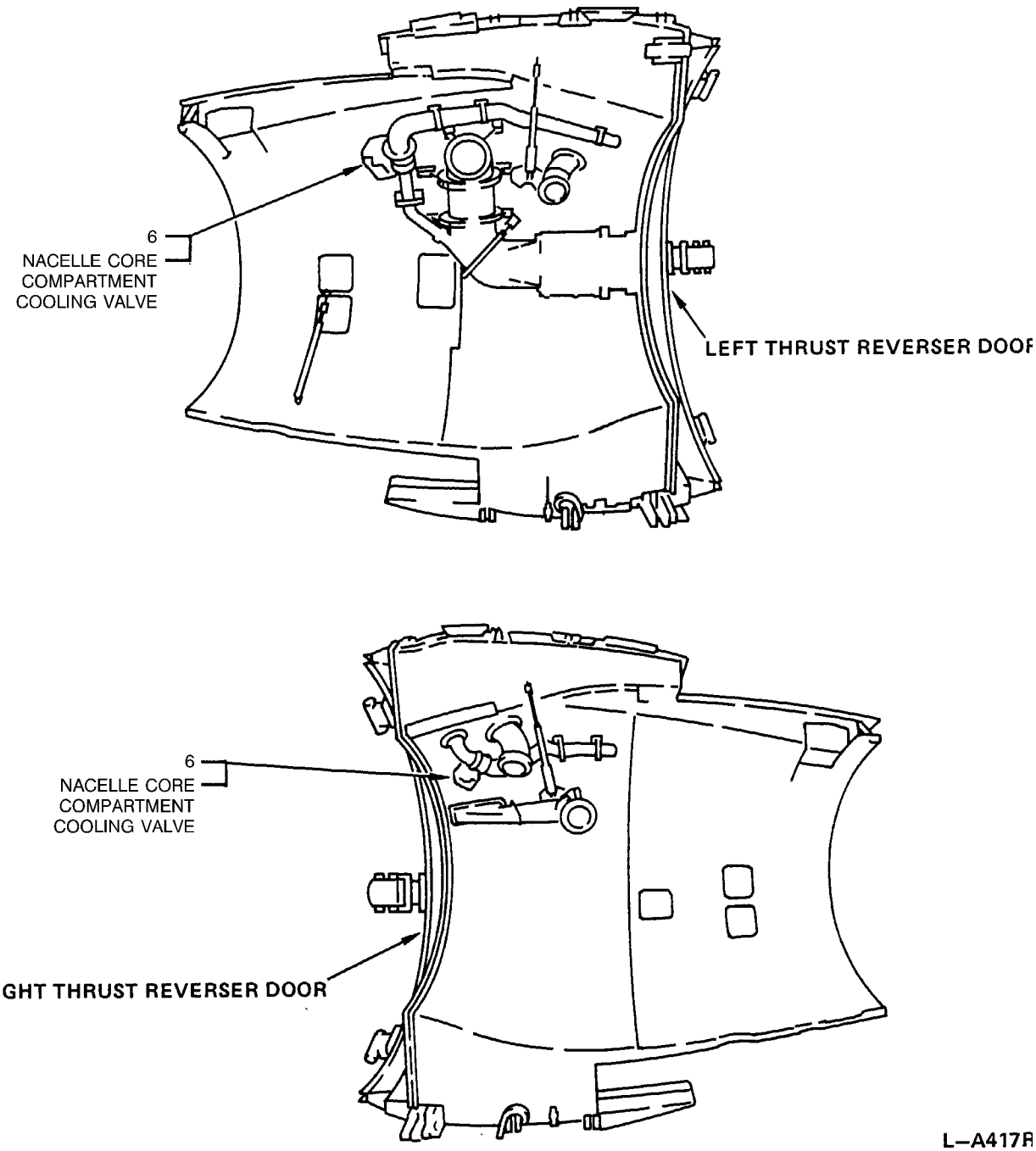
PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG1/FUEL HP VALVE/CTL	3KC	333/T69
133VU	ENGINES/ENG2/FUEL HP VALVE/CTL	4KC	333/T70
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75
22VU	ENG FIRE DET-ENG1 LOOP A	1WD	209/A19
22VU	ENG FIRE DET-ENG2 LOOP A	2WD	209/A24

(c)Check that fire handle is in original (disarm) position.
(d)Disconnect coupling nut of nacelle cooling muscle pneumatic line (1) from tee fitting (2).
(e)Loosen tube coupling nuts (3) on tee fitting (2) and rotate tee fitting (2) so that open port faces outboard. Tighten tube coupling nuts (3) fingertight.
(f)Connect air pressure source (20-100 psi) to nacelle cooling muscle pneumatic line (1).
(g)TORQUE coupling nut (5) to between 300 and 315 lbf.in. (3.39 and 3.55 m.daN).
(h)Connect vacuum pump to pressure port fitting of barometric sense switch (4).
NOTE : The pressure port fitting, MS33656E4, has .4375-20 UNJF -3A threads.
(3)Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).

B. Test System Operation
(1)Set HP fuel valve switch to ON position while air source is supplying 25 to 30 psi (172.4 to 206.8 kPa) air pressure.
Verify that both left and right nacelle cooling valves open.
(2)Apply vacuum to the pressure port of the barometric sense switch to get a pressure of 10.6-11.6 in.Hg (270-295 mm.hg). Verify that both left and right nacelle cooling valves close.
(3)Remove vacuum and verify that both left and right nacelle cooling poppet valves open.
(4)Pull fire handle in flight compartment.



Nacelle Cooling Valve Actuator Test (Sheet 1/4)
Figure 501



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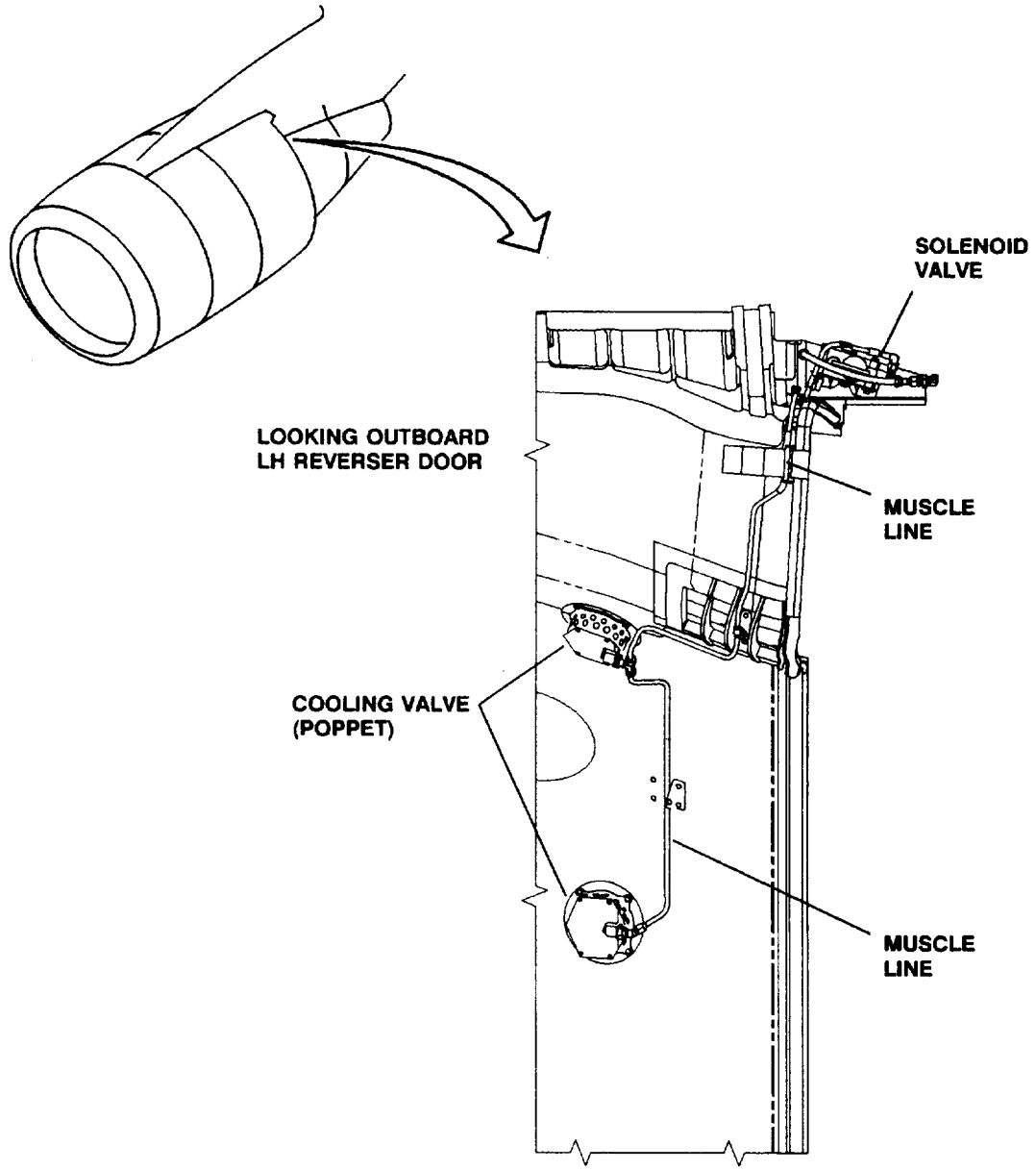
Nacelle Cooling Valve Actuator Test - Spraybar Configuration
(Sheet 2/4)
Figure 501



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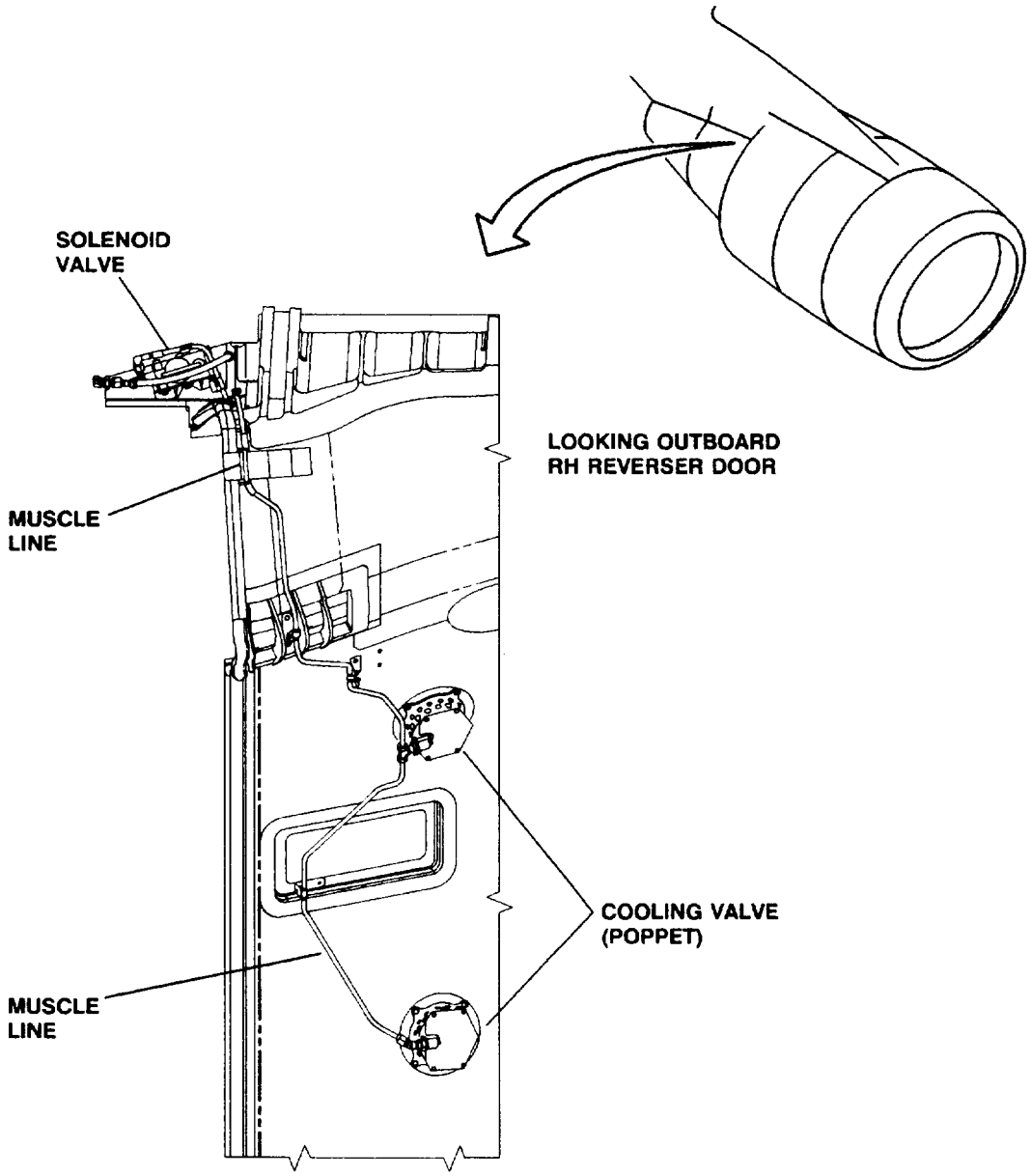
L-A014T (0399)

Nacelle Cooling Valve Actuator Test - Poppet Valves
Configuration - LH Reverser Door (Sheet 3/4)
Figure 501



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L-A046T (0399)

Nacelle Cooling Valve Actuator Test - Poppet Valves
Configuration - RH Reverser Door (Sheet 4/4)
Figure 501

Verify that both left and right nacelle cooling valves close.

(5)Return fire handle to original (disarm) position.
Verify that both left and right nacelle cooling valves open.

(6)Set HP valve switch to OFF position. Verify that both left and right nacelle cooling valves close.

(7)Remove air supply source.

(8)Install tee fitting (2).

(a)Remove protective covers from ends of master actuator diffuser tubes.

(b)Connect master diffuser tube coupling nuts (3) to tee fitting (2). Tighten finger tight.

(c)Connect the muscle line coupling nut (5) to the bottom of the tee fitting (2). TORQUE coupling nut to between 300 and 315 lbf.in. (3.39 and 3.55 m.daN).

(d)TORQUE coupling nuts to between 300 and 315 lbf.in. (3.39 and 3.55 m.daN).

(9)Test valves of minimum opening force.

NOTE : Thrust reverser doors may be lowered to increase access to nacelle cooling valves. Do not latch doors at this time.

(a)Using a push-pull gage, check the force to open each cooling valve is
R between 35 and 45 lbf (15.57 and 20.01 daN).

C. Close-Up

(1)Remove vacuum pump fitting from barometric sense switch (4).

(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(3)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

(4)De-energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).

NACELLE CORE COMPARTMENT COOLING SYSTEM - DEACTIVATION/REACTIVATION

Ref. : MMEL SECTION 1-75 ITEM 4(a) (NAC Cool Valve Open Light)

1. Nacelle Core Compartment Cooling Indicating System

A. Deactivation

(1)Reason for the Job

Failure of nacelle core compartment cooling indicating system.

(2)Equipment and materials

ITEM	DESIGNATION
(1)	Warning Notice
(2)	Circuit Breaker Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

(3)Job set-up

(a)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(4)Procedure

(Ref. Fig. 901, 902)

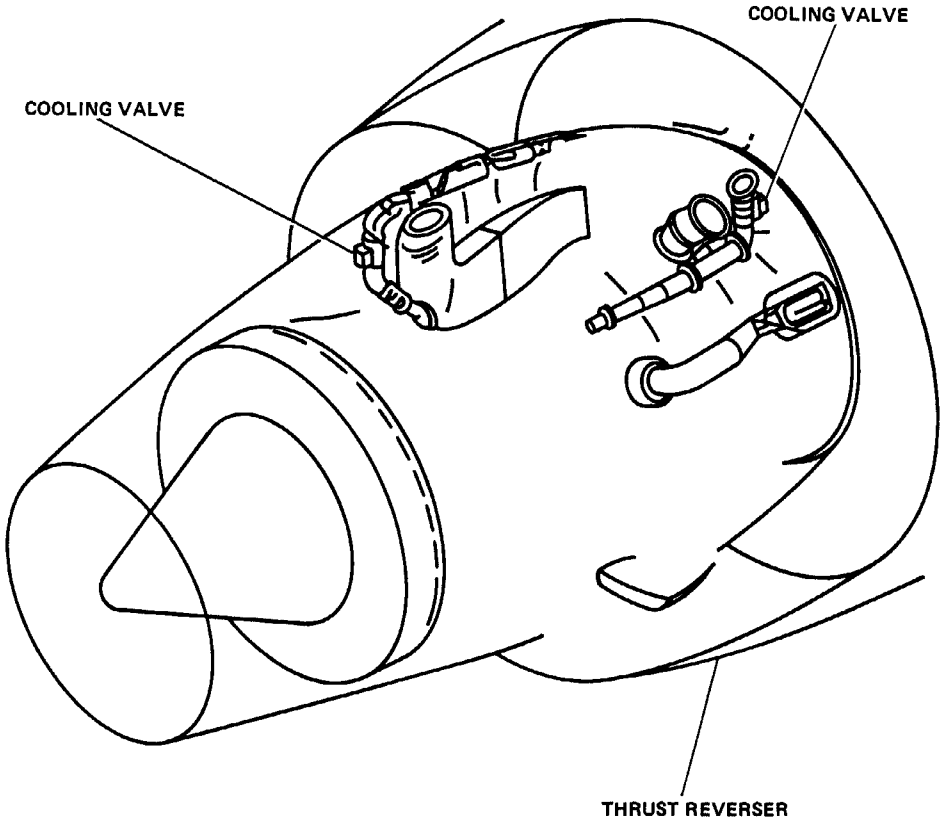
(a)On the LH and RH thrust reversers, check that the visual position indicator of the cooling valves is in closed position.

(5)Close-up

(a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(b)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

(c)Install a warning notice in the flight compartment, indicating that nacelle core compartment cooling indicating system is inoperative.



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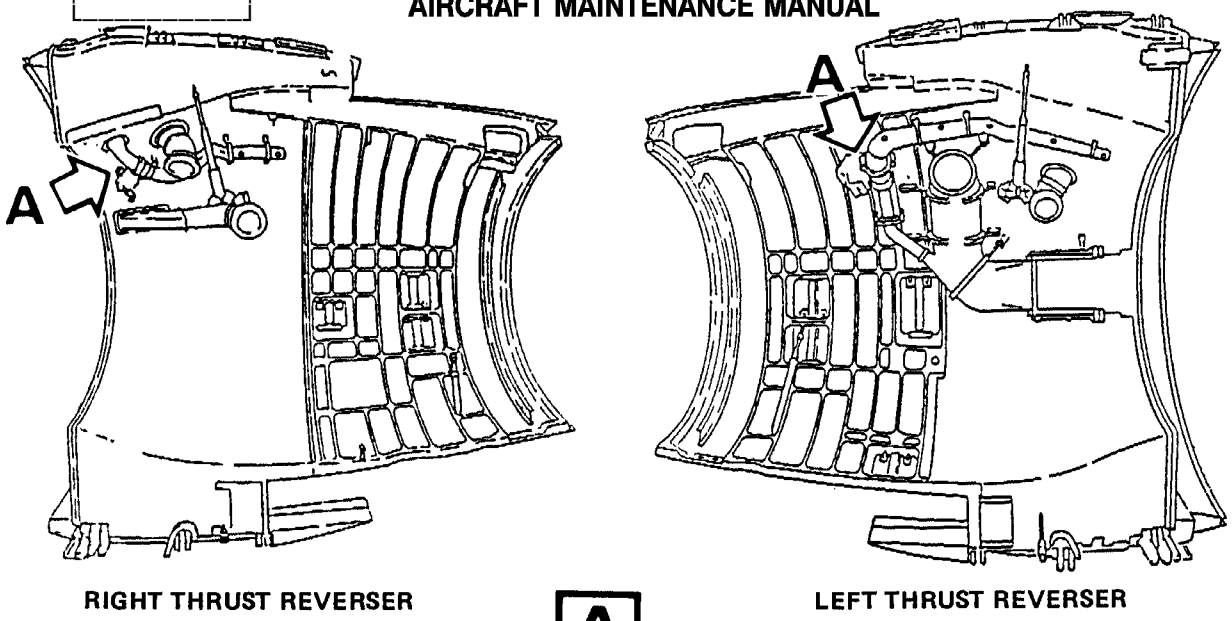
Nacelle Core Compartment Cooling System
Figure 901



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Nacelle Core Compartment Cooling System - Position Indicator
Figure 902

NACELLE CORE COMPARTMENT COOLING INDICATING SYSTEM

Ref. : MMEL SECTION 1.75 Item 4(b) (Cooling Valve)

2. Nacelle Core Compartment Cooling System - Spray Bar Configuration

A. Deactivation

(1)Reason for the Job

Failure of nacelle core compartment cooling system.

(2)Equipment and Materials

ITEM	DESIGNATION
(1)	Warning Notice
(2)	Circuit Breaker Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

(3)Job set-up

(a)Open fan and thrust reverser cowl door corresponding to inoperative cooling valve (Ref. 71-13-00, P. Block 301).

(b)Open, safety and tags the following circuit breaker :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG 1 AND 2	3KU	302/Q75

(4)Procedure (Ref. Fig. 901, 902)

On the cooling valve which is located on the thrust reverser cowl door. (Ref. Fig. 901, 902)

(a)Remove pin from stowed position.

(b)Place override indicator in closed position.

(c)Install pin in locked position.

(5)Close-up

(a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(b)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

(c)Remove safety clip and tag and close circuit breaker 3KU.

(d)Install a warning notice in the flight compartment, indicating that nacelle core compartment cooling system is inoperative.

B. Reactivation

(1)Equipment and materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

(2)Job set-up

(a)Open fan and thrust reverser cowl door corresponding to inoperative cooling valve (Ref. 71-13-00, P. Block 301).
(b)Open, safety and tags the following circuit breaker :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG 1 AND 2	3KU	302/Q75

(3)Procedure (Ref. Fig. 901, 902)
On the inoperative cooling valve which is located on the thrust reverser cowl door
(a)Remove pin from locked position.
(b)Install pin in stowed position.
(c)Perform trouble shooting procedure.
(d)Remove warning notice in flight compartment.
(4)Close-up
(a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(b)Close thrust reverser and fan cowl door and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(c)Remove safety clip and tag and close circuit breaker 3KU.

3. Nacelle Core Compartment Cooling System - Poppet Valves Configuration

A. Deactivation

(1)Reason for the job.
Failure of nacelle core compartment cooling system.
(2)Equipment and Materials

ITEM	DESIGNATION
(a)	Protective Cover
(b)	Safety Clips
(c)	Warning Notice
(d)Material No.P05-074	Special Materials (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

(3)Job set-up
(a)Open fan and thrust reverser cowl door corresponding to inoperative cooling valve (Ref. 71-13-00, P. Block 301).
(b)Open, safety and tags the following circuit breaker :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG 1 AND 2	3KU	302/Q75

(4)Procedure (Ref. Fig. 903)
(a)Locate nacelle cooling poppet valves (Ref. Fig. 904) (4 places). Move red stop screw from outer position to the inside position to

lockout each valve.

(b)Locate solenoid control valves (Ref. Fig. 905) (1). Remove lockwire on connectors. Disconnect electrical connector DV229 (left hand), and connector DV230 (right hand) from solenoid valves (1). Install protective cover on connectors.

(c)Restrain loosened connectors by bending harness (5) back on itself. Tie wrap connector to wire harness, using Material No.P05-074.

(5)Close-up

(a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(b)Close thrust reverser and fan cowl door and remove safety clips and tags and close all the circuit breakers opened in Job Set-Up.

(c)Install a warning notice in the flight compartment indicating that nacelle core compartment cooling system is inoperative.

(d)Make an entry in the aircraft technical log.

B. Reactivation

(1)Equipment and Materials

ITEM	DESIGNATION
(a)	Lockwire, MS35338-138
(b)	Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

(2)Job set-up

(a)Open fan and thrust reverser cowl doors corresponding to inoperative cooling valve (Ref. 71-13-00, P. Block 301).

(b)Open, safety and tags the circuit breaker :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG 1 AND 2	3KU	302/Q75

(3)Procedure (Ref. Fig. 903)

(a)Locate nacelle cooling poppet valves (Ref. Fig. 904) (4 positions). Move red stop screw from inner position to the outer position to enable valves.

(b)Locate solenoid control valves (Ref. Fig. 905) (1). Cut tie wrap, remove protective covers, connect electrical connectors DV229 (left hand), and DV230 (right hand) to receptacle in solenoid valves (15). Tighten connectors fingertight plus one-eighth turn. Install lockwire on connectors.

(c)Troobleshoot the system (Ref. TSM 75-25-40).

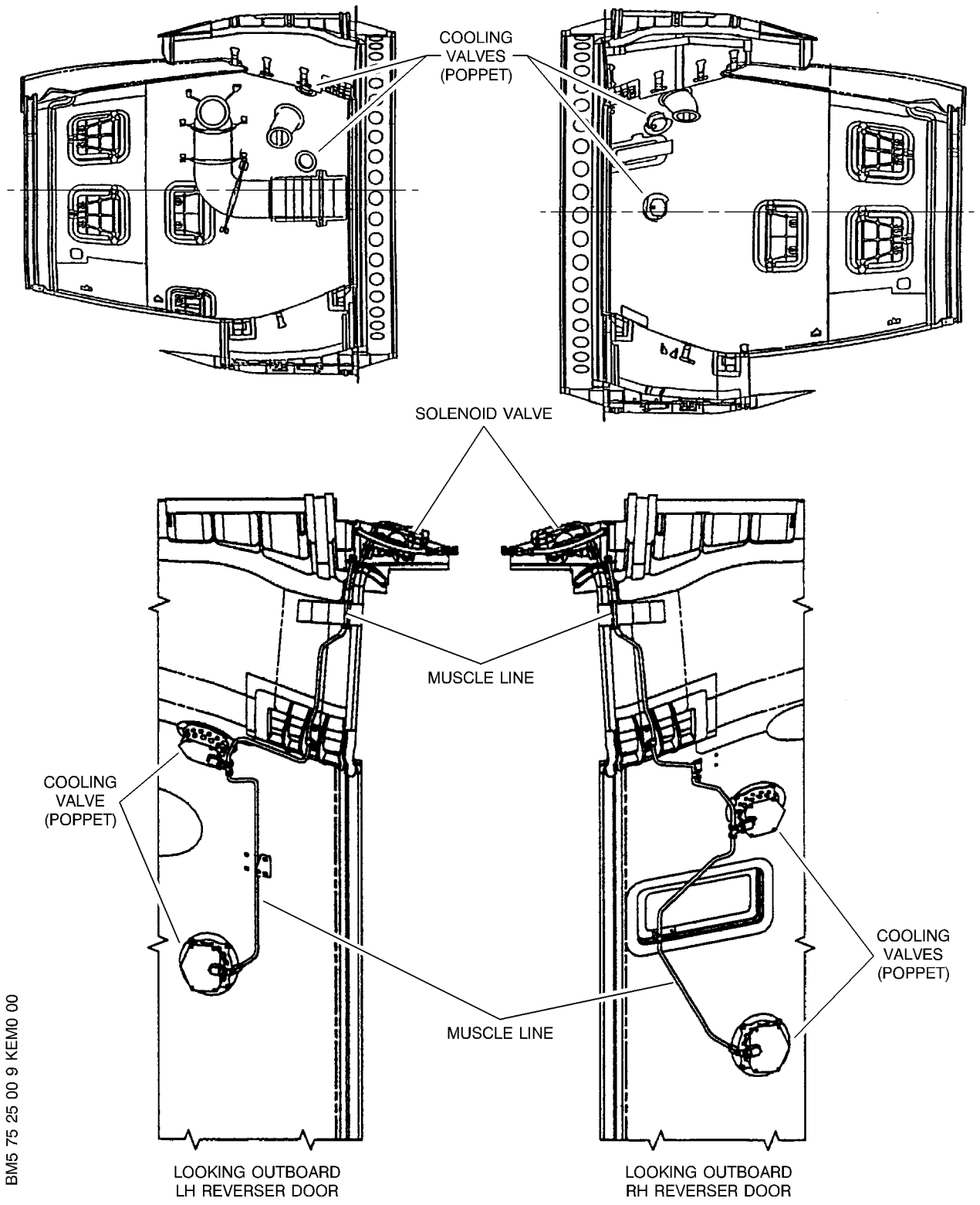
(d)Remove warning notice in the flight compartment.

(4)Close-up

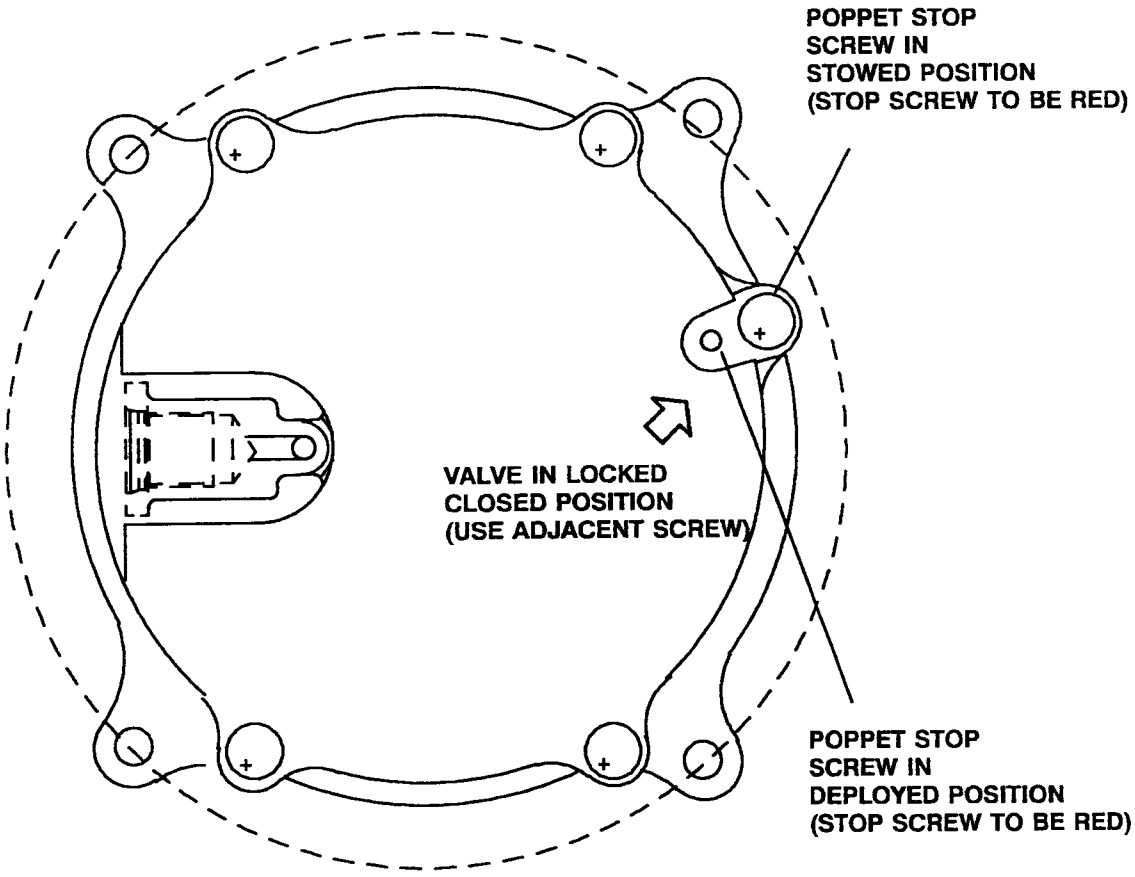
(a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(b)Clear the technical log.

(c)Close thrust reverser and fan cowl door and remove safety clips and



Nacelle Cooling Poppet Valves and Solenoid Valve Location
Figure 903



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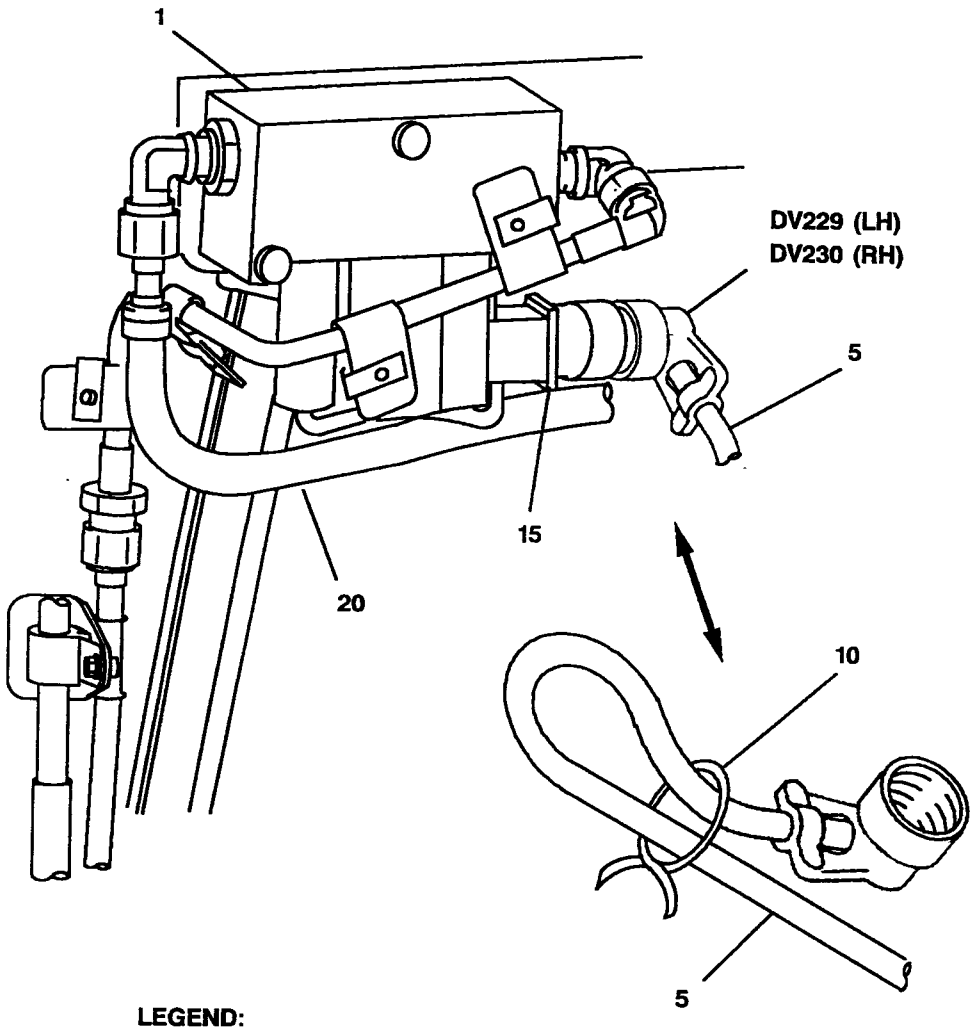
Nacelle Cooling Poppet Valve Lockout
Figure 904



LEGEND:

1 . SOLENOID VALVE
5 . ELECTRICAL HARNESS
10 . TAPE
15 . SOLENOID VALVE RECEPTACLE
20 . HOSE ASSEMBLY

TYPICAL FOR LEFT HAND AND RIGHT HAND

L-A015T

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Nacelle Cooling Solenoid Control Valve Lockout
Figure 905

tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

NACELLE CORE COMPARTMENT COOLING AIR DUCTS AND VALVES - REMOVAL/INSTALLATION

1. Nacelle Core Compartment Cooling System - (Spray Bar Configuration)

A. General

(1)This procedure provides instructions for removal and installation of the nacelle core compartment cooling air ducts and valve.

(2)Access to the nacelle cooling system is through the left thrust reverser door. See 71-13-00, P. Block 301 for thrust reverser door opening and closing procedures.

B. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P06-020	Lubricants (Ref. 70-00-00)
B. Material No.P05-191	Special Materials (Ref. 70-00-00)
C.	Packing
D.	Torque Wrench 130 lbf.in. (1.47 m.daN)
E.	Torque Wrench 55 lbf.in. (0.622 m.daN)
F.	Torque Wrench 100 lbf.in. (1.13 m.daN)
G.	Torque Wrench 80 lbf.in. (0.90 m.daN)
H.	Circuit Breakers Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

C. Remove LH nacelle core compartment cooling air ducts and valve.

(1)Job set-up

(a)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75

(b)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Remove nacelle cooling test (Ref. Fig. 401,).

(a)Remove V-band coupling (2) from nacelle cooling duct (1) and precooler duct (3).

(b)Remove V-band coupling (2) from nacelle cooling duct (1) and nacelle cooling valve (4).

(c)Remove two bolts (5), washers (6) nuts (7) and clamp assembly (8) attaching duct to bracket assembly (9).

(d)Slide duct through bracket assembly (9) and remove.

(3)Remove valve (Ref. Fig. 402) detail D.

(a)Remove union (27) and packing (26) from valve. Discard packing.

(b)Remove nut (21) and washer (22) from support bracket and disconnect ground lead (23) from nacelle cooling valve (24) and bracket.

(c)Disconnect DV227 connector (25) from nacelle cooling valve (24).

(d)Loosen bolt (32) and remove two bolts (28), nuts (30) and washers (29) from support bracket (31).

(e)Remove V-band coupling (2) attaching nacelle cooling valve (4) to spray bar assembly (10) and remove valve (24) and bracket (31). Discard bracket and insert (Ref. Fig. 402).

(4)Remove spray bar assembly (10).

(a)Remove two bolts (5), washers (6) nuts (7) and clamp assembly (8) attaching spray bar to bracket assembly (9).

(b)Remove two bolts (11), washers (6), clamp assembly (12), shims (13) and clip (14) from bracket (15) on inner barrel structure.

(c)Remove pins (16), collars (17), clamp assemblies (18), shims (19) and clips (20) to remove spray bar from inner barrel structure.

(d)Slide spray bar aft from between inner barrel structure and thrust reverser door opening actuator and remove spray bar.

D. Install LH nacelle core compartment cooling ducts and valve.
(Ref. Fig. 401,)

(1)Install nacelle cooling duct (1) on precooler duct (3).

(a)Put nacelle cooling duct (1) through lower clamp bracket assembly (9) on inner barrel structure and position on precooler duct.

(b)Install nacelle cooling duct on lower clamp bracket assembly (9) with clamp assembly (8), bolts (5), washers (6) and nuts (4). Do not fully torque bolts at this time.

(c)Connect nacelle cooling duct to precooler duct assembly with V-band coupling (2). Do not fully torque coupling at this time.

(2)Install valve (Ref. Fig. 402).

(a)Position bracket (31) onto valve assembly with bolt (32) two washers, nut. Tighten bolt (32) fingertight.

(b)Connect nacelle cooling valve (4) to nacelle cooling duct (1) with V-band coupling (2). Do not fully torque coupling at this time.

(c)Align bracket (31) 89.5° - 90.5° from valve centerline and 0.17 - 0.18 in. (4.3 - 4.6 mm) from valve casting.
Install insert onto bracket (31) or five wraps 0.02 in. (0.51 mm) thick of 1 in. (25.4 mm) wide.
TORQUE bolt (32) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN.).

(d)Attach bracket (31) with two bolts (28), four washers (29) and two nuts (30). TORQUE bolts to between 50 and 70 lbf.in. (0.56 and 0.79 m.daN).

(e)Attach ground lead (23) on wire harness to valve (24) and bracket with nut (21) and washer (22). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(f)Connect DV227 connector (25) on wire harness to valve (24) fingertight plus one-eighth turn.

(g)Apply Material No.P06-020 to threads of union (27) and install union (27) and packing (26) in valve (24). TORQUE union to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN).

(3)Install spray bar assembly (10).

(a)Put spray bar (10), through upper clamp bracket assembly (9) on inner barrel structure and position on nacelle cooling valve (4).

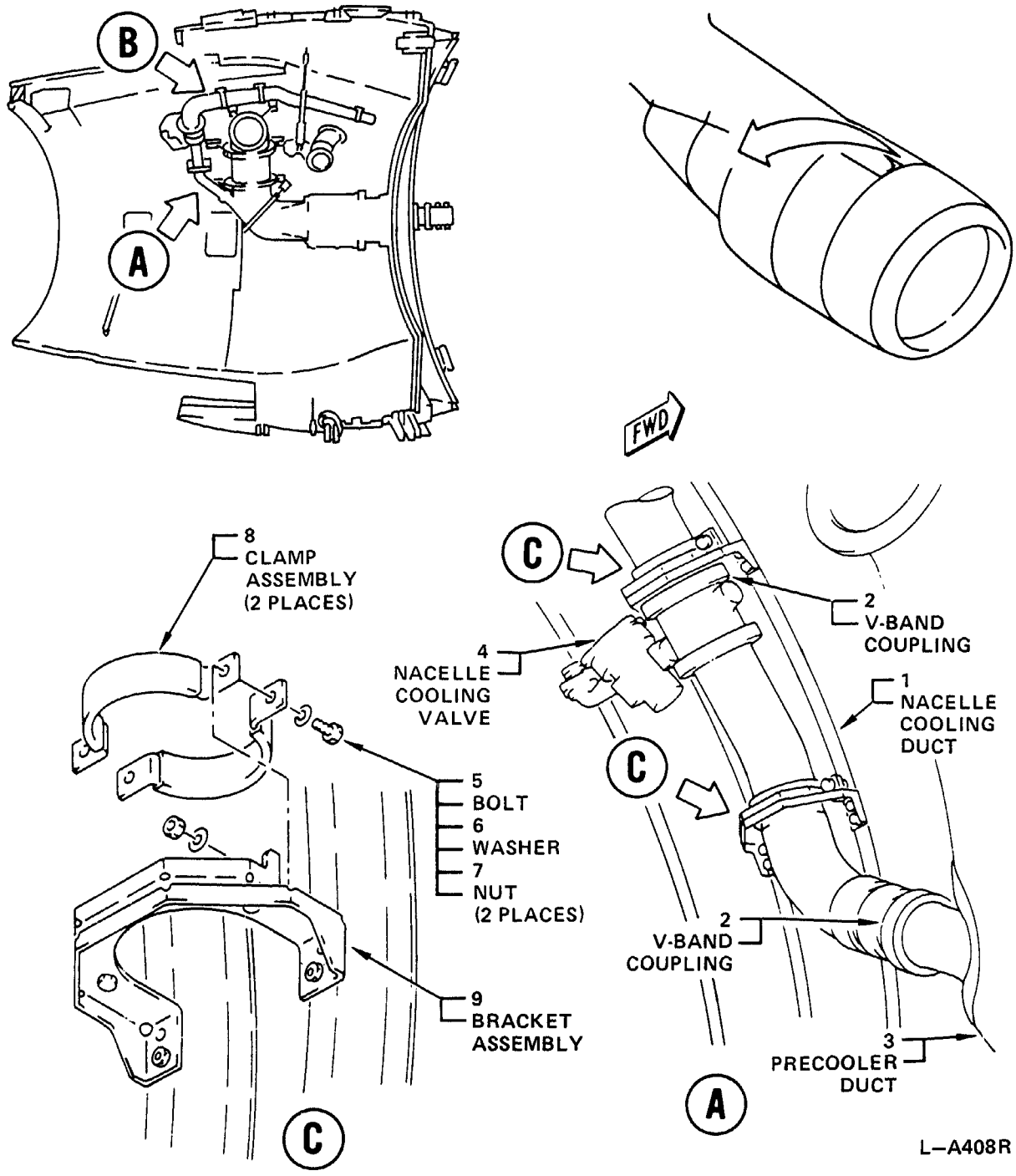
(b)Install spray bar on upper clamp bracket assembly (9) with clamp assembly (8), bolts (5), washers (6) and nuts (4). Do not fully torque bolts at this time.

(c)Connect spray bar (10) to valve (4) with V-band coupling (2). Do

not fully torque coupling at this time.
(d)Attach spray bar (10) to inner barrel structure with clamp assembly (12), two bolts (11), washers (6), shims (13) and clip (14). Tighten bolts (11) fingertight. Adjust shims to maintain a minimum gap of 0.10 in. (2.54 mm) between spray bar and thrust reverser inner barrel structure.
(e)Attach spray bar (10) to inner barrel structure with clamp assemblies (18), pins (16), collars (17), shims (19) and clips (20). Adjust shims to maintain a minimum gap of 0.10 in. (2.54 mm) between spray bar and thrust reverser inner barrel structure.
(f)TORQUE bolts (11) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(4)TORQUE nacelle cooling valve V-band couplings (2) to 50 lbf.in. (0.56 m.daN).
(5)Adjust lower clamp assembly (8) to maintain a minimum clearance of 1.375 in. (34.9 mm) between inner barrel structure and bellows assembly of cooling duct (1).
(6)TORQUE clamp assembly bolts (5) to between 50 and 70 lbf.in. (0.56 and 0.79 m.daN).
(7)TORQUE nacelle cooling duct V-band coupling (2), to 50 lbf.in. (0.56 m.daN).
(8)Close-up
(a)Close fan and reverser cowl doors, remove safety clips and tags and close circuit breakers. (Ref. 71-13-00, P. Block 301).

E. Remove RH nacelle core compartment cooling valve and spray bar. (Ref. Fig. 403)
(1)Job Set-up
(a)Open, safety and tag circuit breakers and open fan and thrust reverser fan cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove nacelle cooling valve (1)
(a)Remove V-band coupling (4) from nacelle cooling duct (5) and nacelle cooling valve (1).
(b)Remove V-band coupling (4) attaching nacelle cooling valve (1) to spray bar assembly (6) and remove valve.
(c)Remove 2 nuts (2) and washers (3) attaching nacelle cooling valve (1) to support bracket on inner barrel structure.
(3)At three places, remove two bolts (7), washers (8) nuts (9) and clamp assembly (10) attaching spray bar to bracket assembly.
(4)Slide spray bar forward from between inner barrel surface and thrust reverser door opening actuator and remove spray bar.

F. Install RH nacelle core compartment cooling valve and spray bar. (Ref. Fig. 403)
(1)Install spray bar assembly (6).
(a)Slide spray bar (6) aft between thrust reverser door opening actuator and inner barrel structure.
(b)At three places, install spray bar on inner barrel structure with clamp assembly (10), two bolts (7), washers (8) and nuts (9). Do not fully torque bolts at this time.
(2)Connect nacelle cooling valve (1) to nacelle cooling duct (5) with V-band coupling (4). Do not fully torque coupling at this time.



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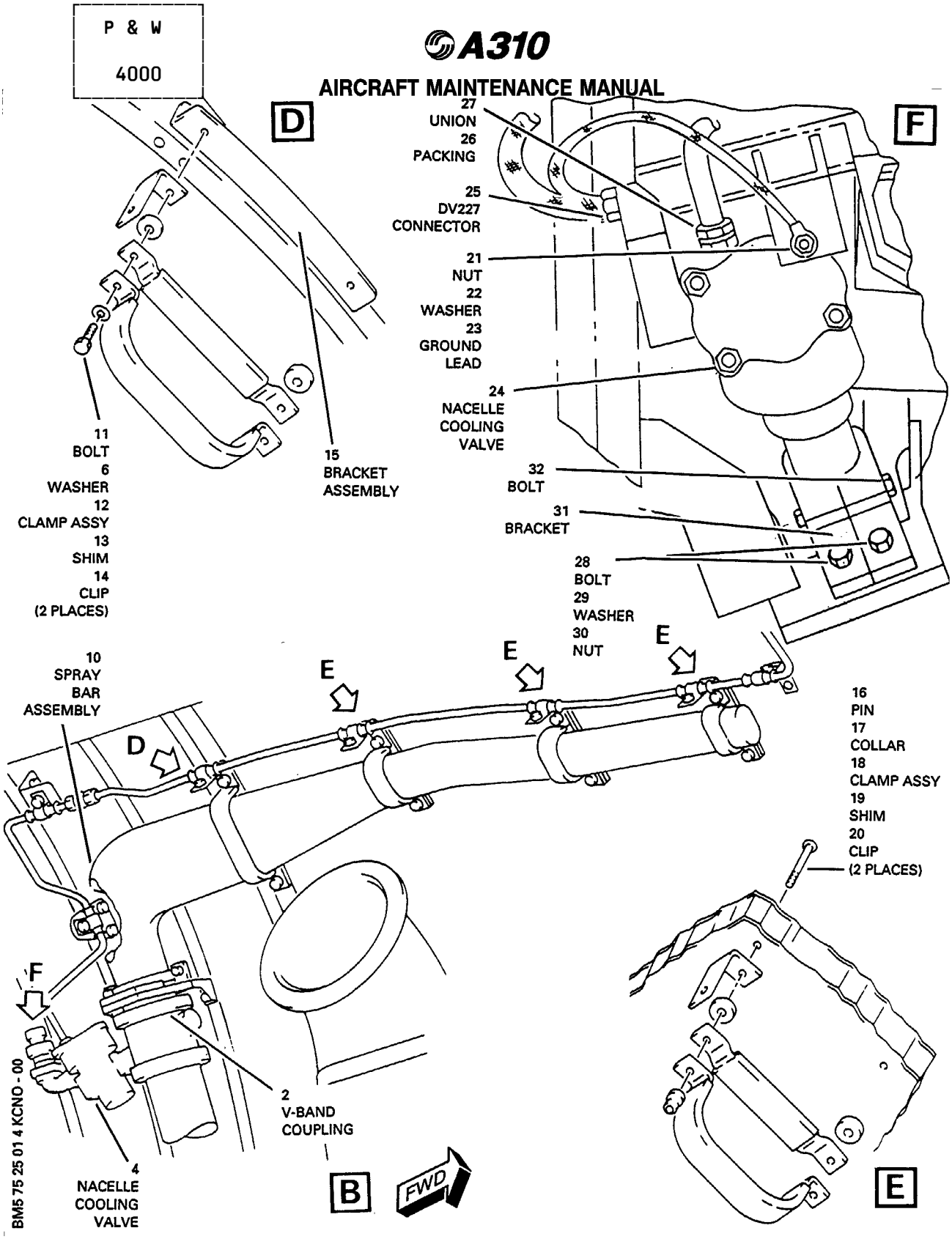
Nacelle Core Compartment Cooling Ducts and Valve
Figure 401



Nacelle Core Compartment Cooling Ducts and Valve
Figure 402

(3)Install valve (1) on support bracket with 2 washers (3) and nuts (2). TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(4)Connect spray bar (6) to valve (1) with V-band coupling (4). Do not fully torque coupling at this time.
(5)Adjust clamp assemblies (10) to eliminate preload and to maintain a minimum 0.25 and 0.35 in. (6.35 and 8.89 mm) clearance between inner barrel structure and spray bar.
(6)TORQUE nuts (9) of three clamp assemblies to between 50 and 70 lbf.in. (0.56 and 0.79 m.daN).
(7)TORQUE nacelle cooling valve V-band couplings (4) to 50 lbf.in. (0.56 m.daN).
(8)Close-up
(a)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(b)Remove safety clips and tags and close circuit breaker : 3KU.

2. Nacelle Core Compartment Cooling System (Poppet Valves Configuration)

A. Equipment and Materials

ITEM	DESIGNATION
A.	Access Platform
B.	Protective Covers
C.	Safety Clips
D.	O-Ring
E.	Torque Wrench 280 lbf.in. (3.164 m.daN)
F.	Torque Wrench 170 lbf.in. (1.921 m.daN)
G.	Torque Wrench 210 lbf.in. (2.712 m.daN)
H.	Torque Wrench 55 lbf.in. (0.622 m.daN)
I.	Torque Wrench 100 lbf.in. (1.13 m.daN)
J.	Torque Wrench 270 lbf.in. (3.051 m.daN)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

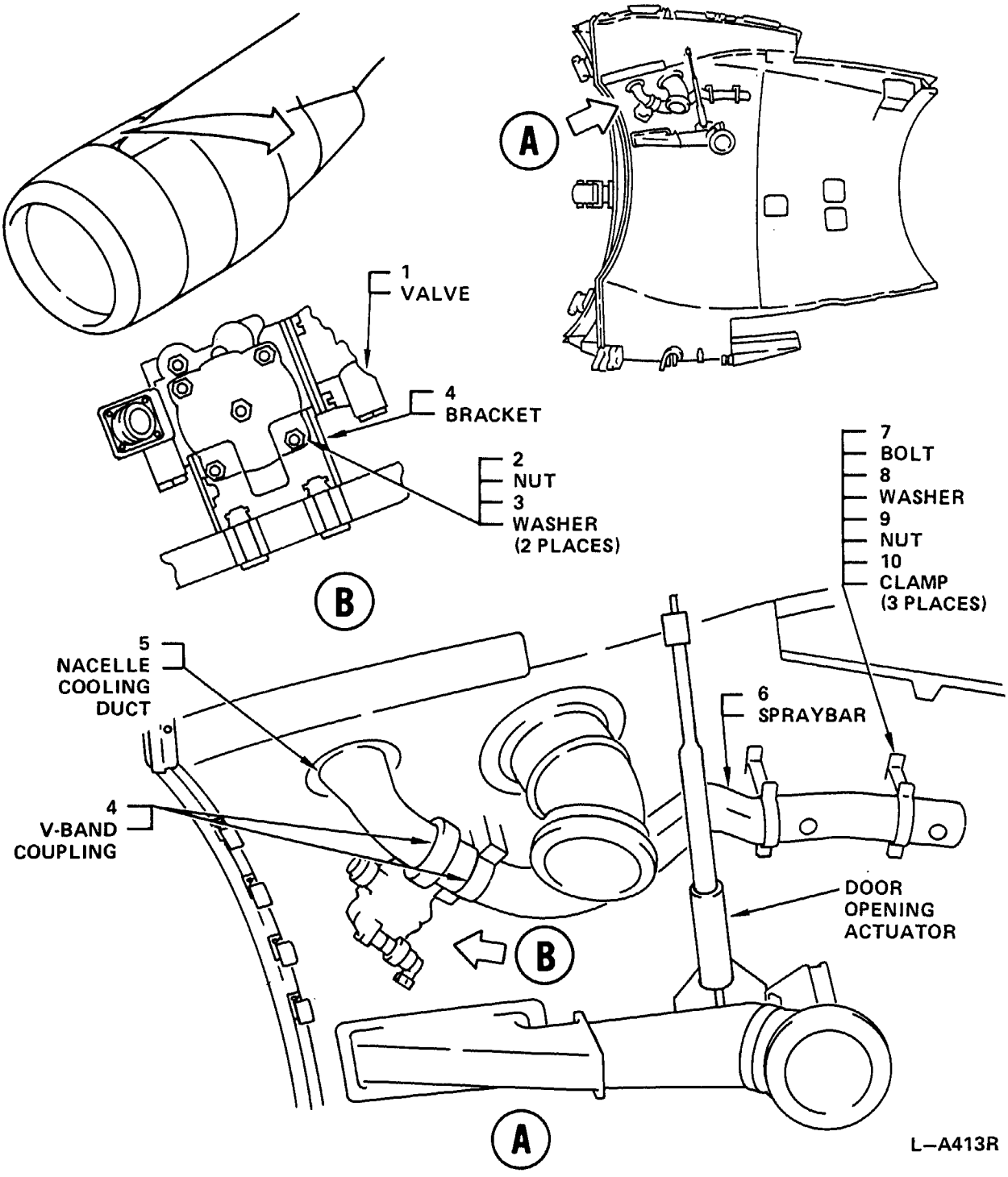
(1)Open, safety and tag the following circuit breaker :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75

(2)Install access platform.
(3)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Removal

(Ref. Fig. 404, 405, 406)
(Ref. Fig. 407, 408, 409)
(Ref. Fig. 410)
(1)Disconnect tube assembly (1) from 45 degree elbow (2) on the lower left



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Nacelle Core Compartment Cooling Valve and Spray Bar
Figure 403

nacelle cooling valve (3). Remove the nut (4), elbow (2), and O-ring (5) from the cooling valve. Discard the O-ring. Install protective cover on open port.

(2) Remove the pins (6), collars (7) and washers (8) attaching the lower left nacelle cooling valve (3) and remove the valve from the thrust reverser door.

(3) Disconnect tube assemblies (1 and 9) from the tee (10) on upper left nacelle cooling valve (11). Remove the nut (4), tee (10) and O-ring (5) from the cooling valve. Discard the O-ring. Install protective cover on open port.

(4) Remove the pins (6), collars (7) and washers (8) attaching the upper left nacelle cooling valve (11) and remove the valve from the thrust reverser door.

(5) Disconnect tube assembly (9) from tube assembly (12).

(6) Remove the screw (13), nut (14), washer (15) and clamp (16) attaching tube assembly (9) to bracket on the fan duct.

(7) Remove the screw (13), nut (14), washer (15) and clamp (16) attaching tube assembly (9) to bracket on thrust reverser door. Reinstall existing wire harness to bracket. Tighten clamp-nut handtight.

NOTE : Wire harness and tube assembly are clamped to same bracket with shared hardware. Temporarily reclamp wire harness to bracket with hardware removed in step (7).

(8) Disconnect tube assembly (12) from 90 degree elbow (18) in solenoid valve at top of left hand thrust reverser door.

(9) Remove nut (4), 90 degree elbow (18) and O-ring (5) from port in solenoid valve. Install protective cover in open port. Discard O-ring.

(10) Disconnect hose assembly (19) from 90 degree elbow (18) in solenoid valve (20) at top of left hand thrust reverser door.

(11) Remove nut (4), 90 degree elbow (18) and O-ring (5) from port in solenoid valve (20). Install protective cover in open port. Discard O-ring.

(12) Disconnect electrical harness connector DV229 from solenoid valve (20).

(13) Remove three bolts (21) and washers (22) attaching solenoid valve (20) to bracket on left hand thrust reverser door.

(14) Disconnect tube assembly (24) from 45 degree elbow (2) on the lower right nacelle cooling valve (25). Remove the nut (4), elbow (2), and O-ring (5) from the cooling valve. Discard the O-ring. Install protective cover on open port.

(15) Remove the pins (6), collars (7) and washers (8) attaching the lower lower right nacelle cooling valve (25) and remove the valve from the thrust reverser door.

(16) Disconnect tube assemblies (24 and 26) from the tee (10) on upper right nacelle cooling valve (27). Remove the nut (4), tee (10) and O-ring (5) from the cooling valve. Discard the O-ring. Install protective cover on open port.

(17) Remove the pins (6), collars (7) and washers (8) attaching the upper right nacelle cooling valve (27) and remove the valve from the thrust reverser door.

(18) Remove the screw (13), nut (14), washer (15) and clamp (16) attaching tube assembly (24) to bracket on the TCC duct.

(19) Disconnect tube assembly (26) from tube assembly (28).

(20) Remove the screw (13), nut (14), washer (15) and clamp (16) attaching

tube assembly (26) to bracket on the thrust reverser door.

(21)Remove the screw (13), nut (14), washer (15) and clamp (16) attaching tube assembly (26) to bracket on the fan duct.

(22)Remove the screw (13), nut (14), washer (15) and clamp (16) attaching tube assembly (26) to bracket on thrust reverser door. Reinstall existing wire harness to bracket. Tighten clamp-nut handtight.

NOTE : Wire harness and tube assembly are clamped to same bracket with shared hardware. Temporarily reclamp wire harness to bracket with hardware removed in step (22).

(23)Disconnect tube assembly (28) from 90 degree elbow (18) in solenoid valve at top of right hand thrust reverser door.

(24)Remove nut (4), 90 degree elbow (18) and O-ring (5) from port in solenoid valve. Install protective cover in open port. Discard O-ring.

(25)Disconnect hose assembly (29) from 90 degree elbow (18) in solenoid valve (30) at top of right hand thrust reverser door.

(26)Remove nut (4), 90 degree elbow (18) and O-ring (5) from port in solenoid valve (30). Install protective cover in open port. Discard O-ring.

(27)Disconnect electrical harness connector DV230 from solenoid valve (30).

(28)Remove three bolts (21) and washers (22) attaching solenoid valve (30) to bracket on right hand thrust reverser door.

D. Installation

(Ref. Fig. 404, 405, 406)
(Ref. Fig. 407, 408, 409)
(Ref. Fig. 410)

NOTE : Install nacelle cooling valves by aligning deflector cutouts with installation pins plus or minus two degrees.

(1)Install the lower left nacelle cooling valve (3) with collars (7), pins (6) and washers (8). TORQUE pins to between 200 and 250 lbf.in. (2.26 and 2.82 m.daN).

(2)Install 45 degree elbow (2) and O-ring (5) into port of lower left nacelle cooling valve (3) with nut (4). TORQUE nut to between 130 and 140 lbf.in. (1.47 and 1.58 m.daN).

(3)Connect tube assembly (1) to 45 degree elbow (2). TORQUE tube coupling nut to between 200 and 210 lbf.in. (2.26 and 2.37 m.daN).

(4)Install the upper left nacelle cooling valve (11) with collars (7), pins (6) and washers (8). TORQUE pins to between 200 and 250 lbf.in. (2.26 and 2.82 m.daN).

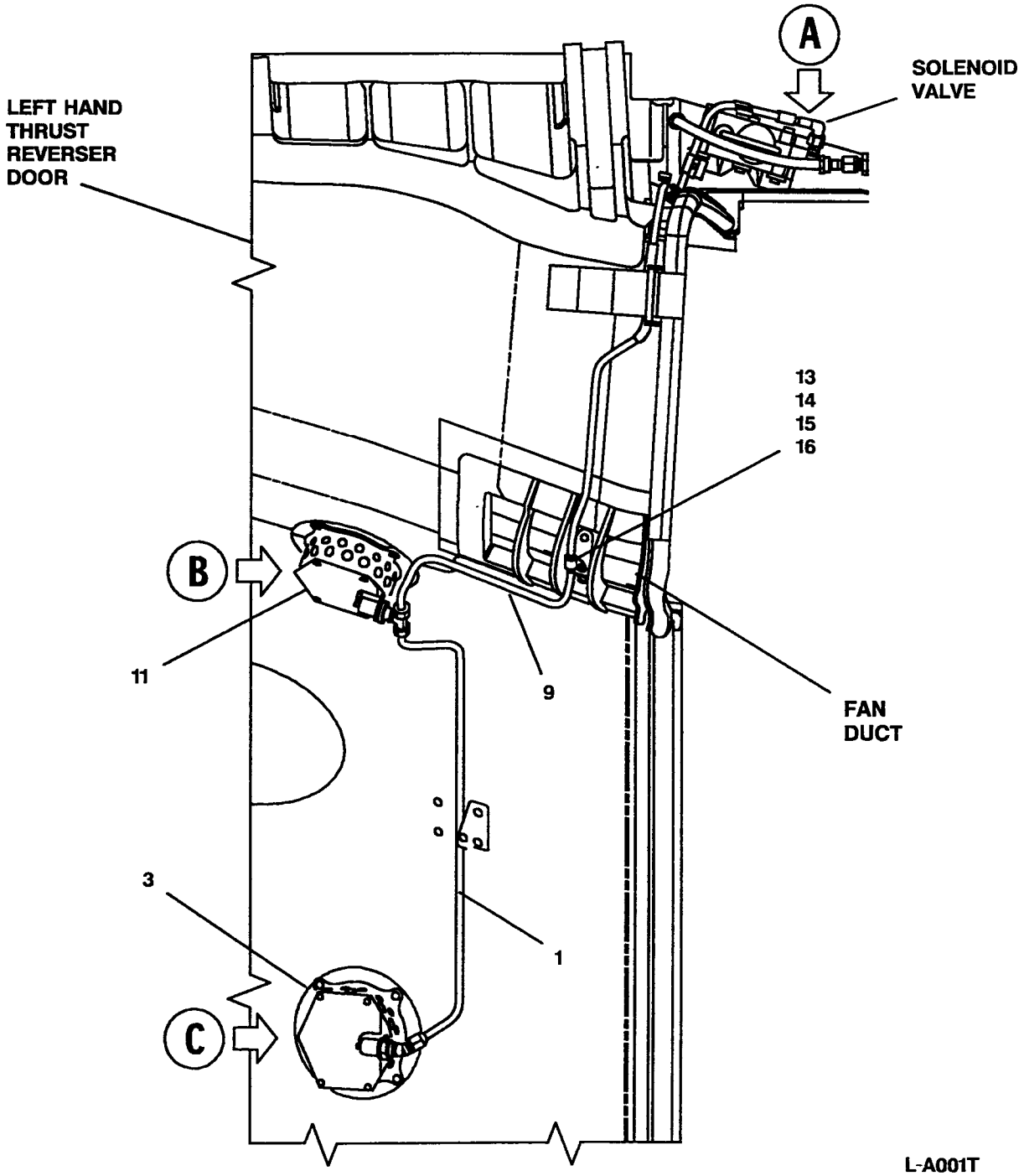
(5)Install tee (10) and O-ring (5) into port of upper left nacelle cooling valve (11) with nut (4). TORQUE nut to between 130 and 140 lbf.in. (1.47 and 1.58 m.daN).

(6)Connect tube assemblies (1 and 9) to tee (10). TORQUE tube coupling nuts to between 200 and 210 lbf.in. (2.26 and 2.37 m.daN).

(7)Attach tube assembly (1) to bracket on thrust reverser door with clamp (16), screw (13), washer (15), and nut (14). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(8)Attach tube assembly (9) to bracket on air duct with clamp (16), screw (13), washer (15), and nut (14). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(9)Install solenoid valve (20) on bracket at top of the thrust reverser door with three bolts (21) and washers (22). TORQUE bolts to between 50



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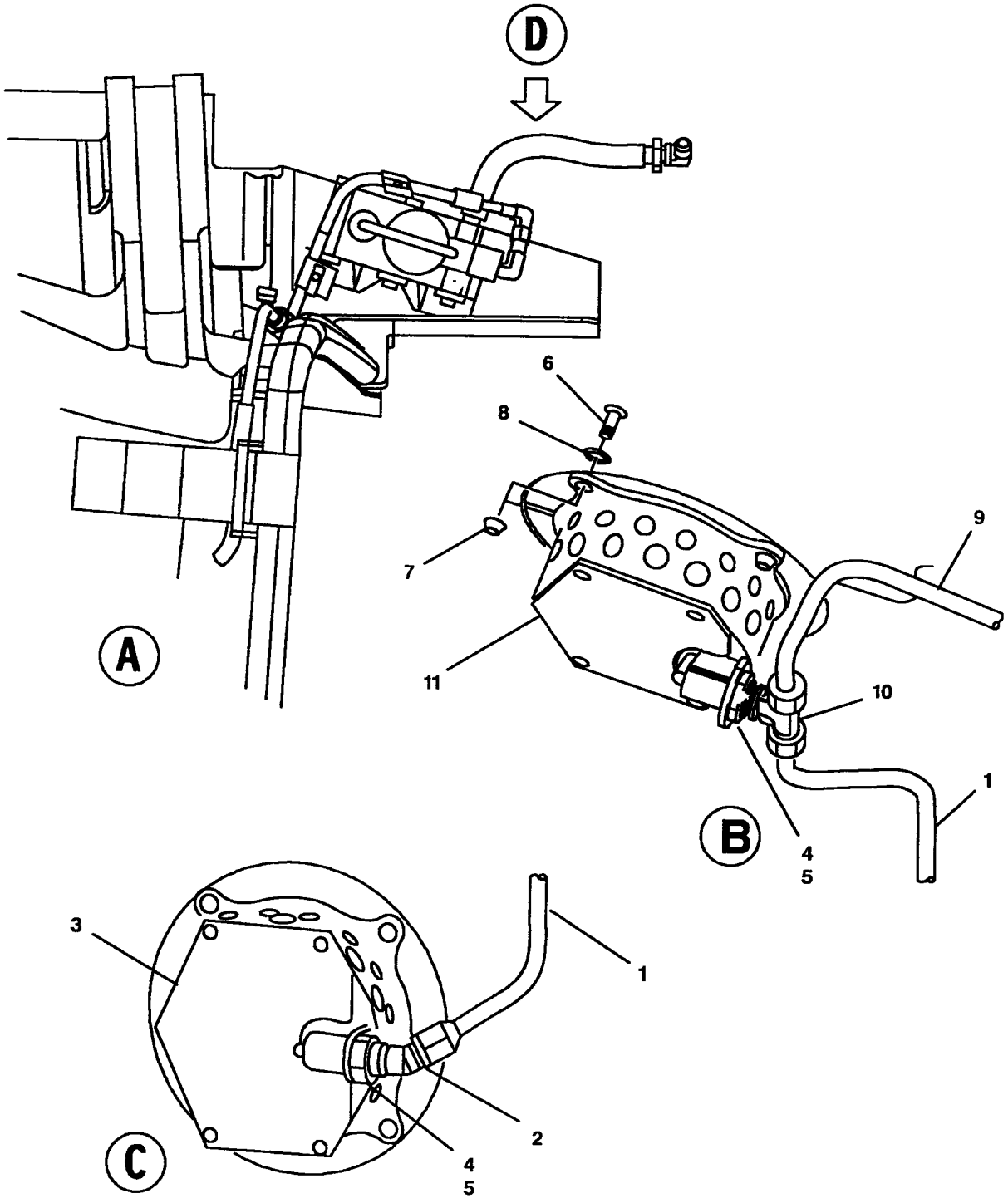
Nacelle Cooling System - Left Hand Side
Figure 404



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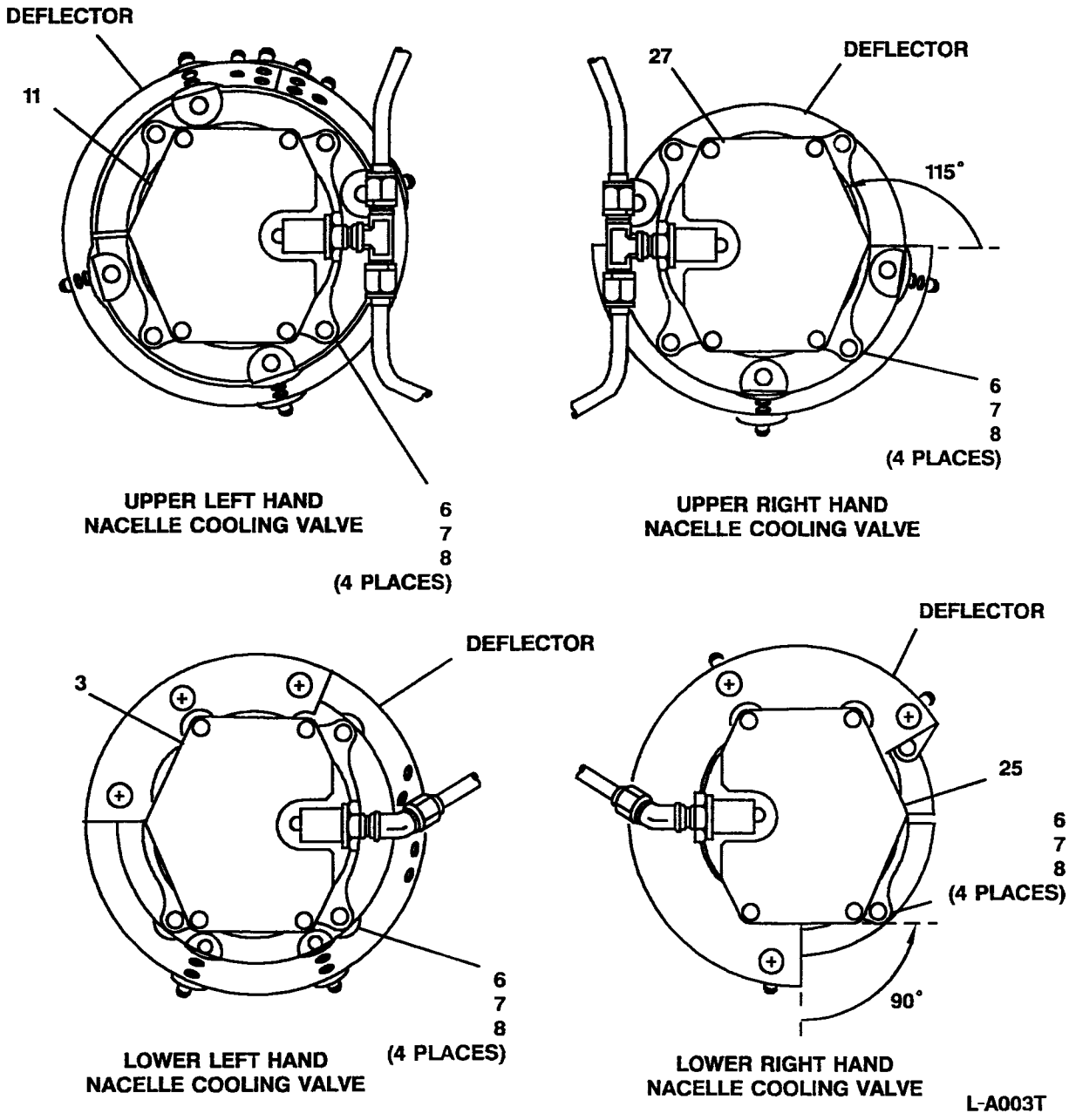
Nacelle Cooling Valves - Left Hand Side
Figure 405



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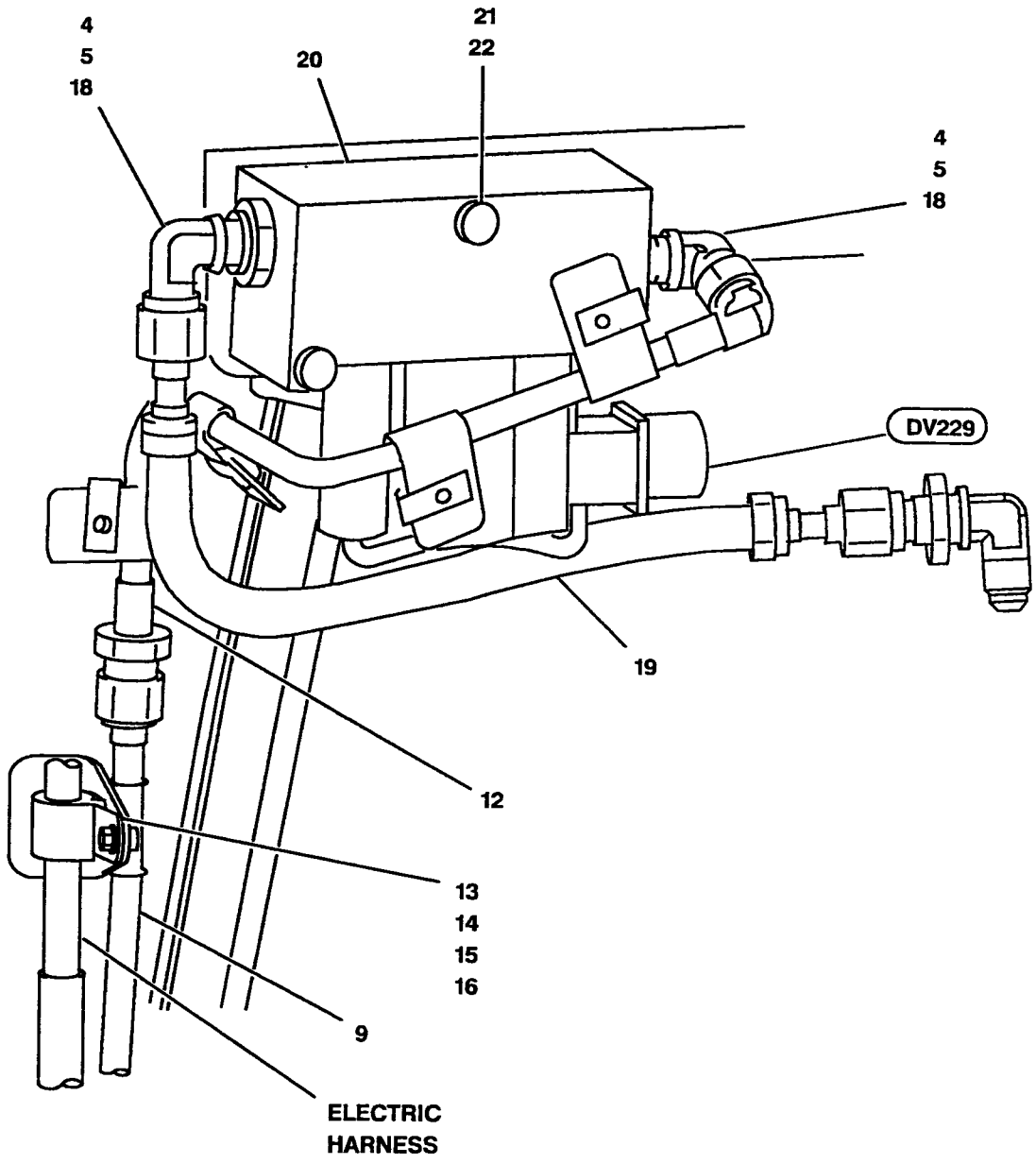
Nacelle Cooling Valves
Figure 406



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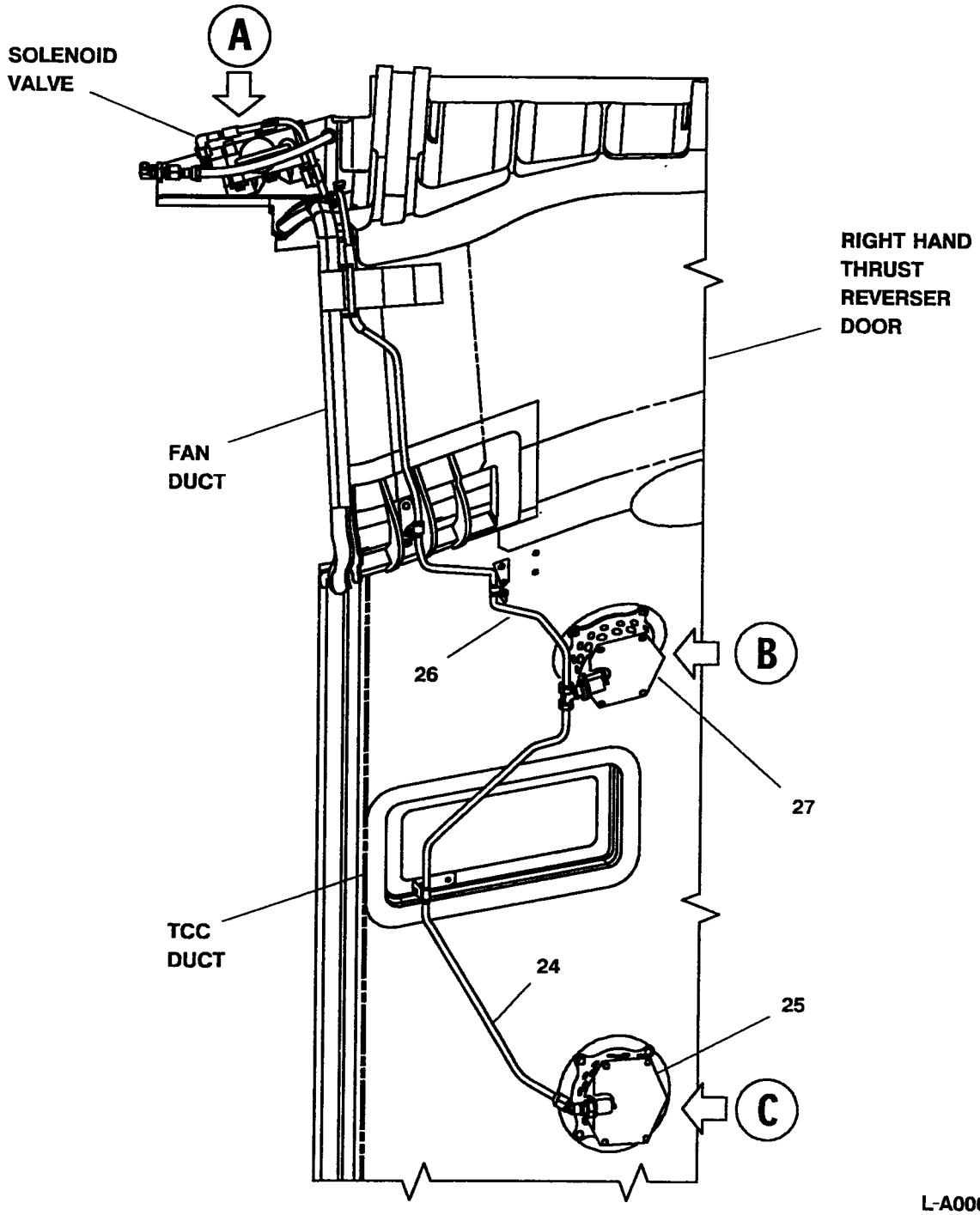
Nacelle Cooling - Solenoid Valve
Figure 407



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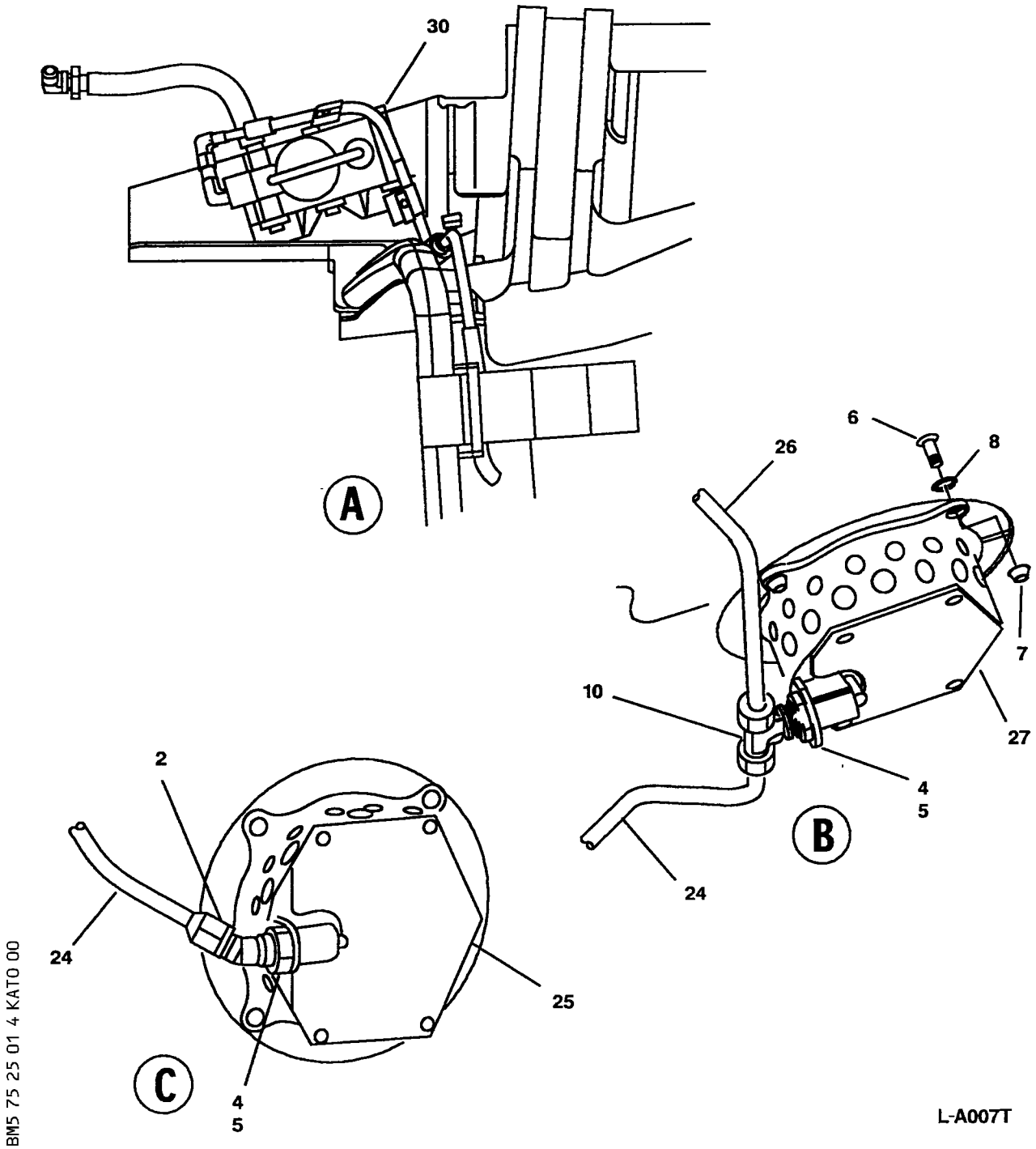
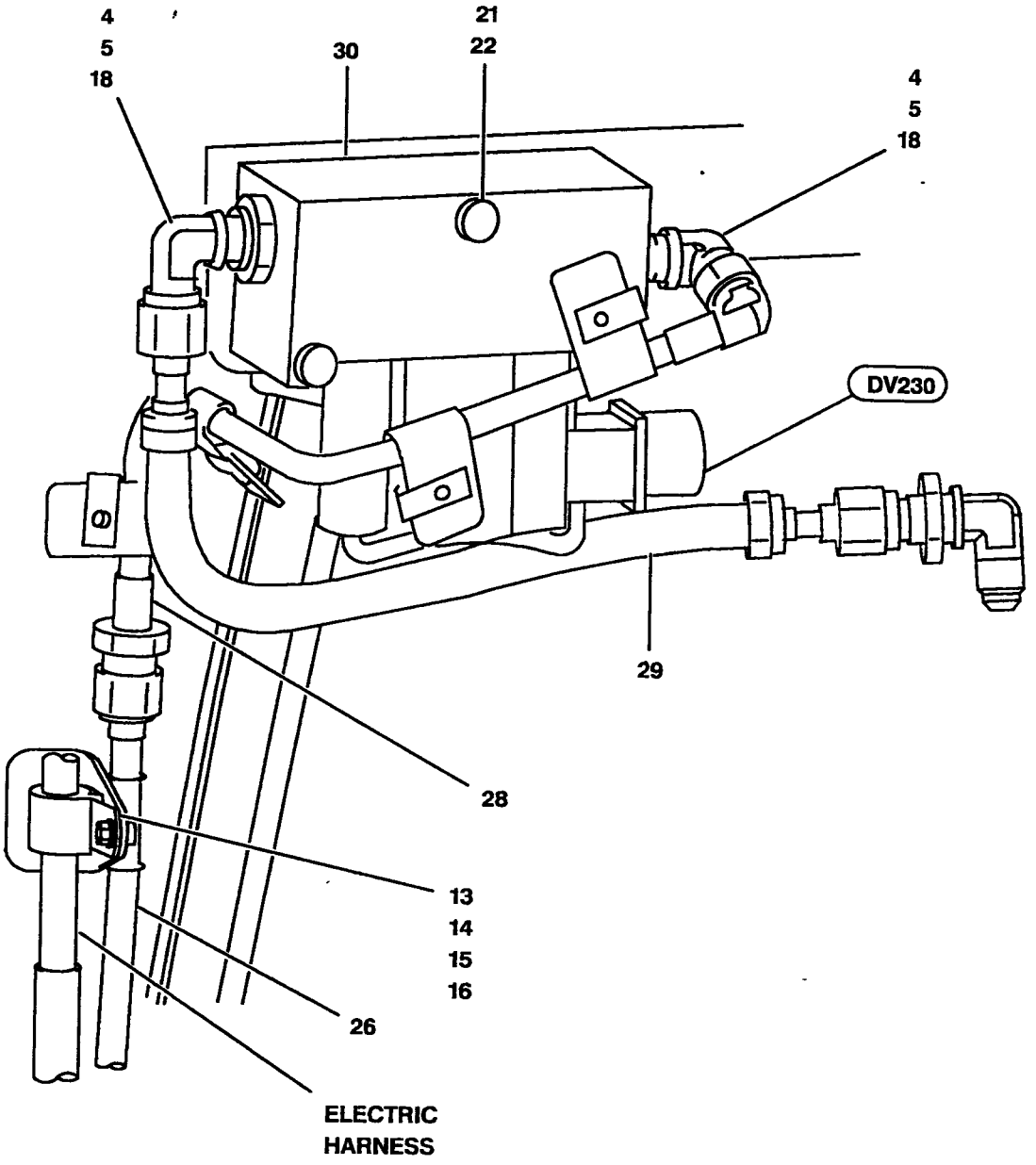
Nacelle Cooling System - Right Hand Side
Figure 408



Nacelle Cooling Valves - Right Hand Side
Figure 409



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Nacelle Cooling - Solenoid Valve
Figure 410

and 70 lbf.in. (0.57 and 0.79 m.daN).
(10)Install 90 degree elbow (18) in port on forward side of the solenoid valve (20) with O-ring (5) and nut (4). TORQUE nut to between 130 and 140 lbf.in. (1.47 and 1.58 m.daN).
(11)Connect tube assembly (12) to 90 degree elbow (18). TORQUE tube coupling nut to between 200 and 210 lbf.in. (2.26 and 2.37 m.daN).
(12)Connect tube assembly (12) to tube assembly (9). TORQUE tube coupling nut to between 200 and 210 lbf.in. (2.26 and 2.37 m.daN).
(13)Attach tube assembly to bracket on thrust reverser door with clamp (16), screw (13), washer (15), and nut (14). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(14)Install 90 degree elbow (18) in port on aft side of the solenoid valve (20) with O-ring (5) and nut (4). TORQUE nut to between 130 and 140 lbf.in. (1.47 and 1.58 m.daN).
(15)Connect hose assembly (19) to 90 degree elbow (18). TORQUE hose coupling nut to between 170 and 240 lbf.in. (1.92 and 2.70 m.daN).
(16)Connect electrical connector DV229 to receptacle in solenoid valve. Tighten connector fingertight plus one-eighth turn. Lockwire connector.
(17)Install the lower right nacelle cooling valve (25) with collars (7), pins (6) and washers (8). TORQUE pins to between 200 and 250 lbf.in. (2.26 and 2.82 m.daN).
(18)Install 45 degree elbow (2) and O-ring (5) into port of lower right nacelle cooling valve (25) with nut (4). TORQUE nut to between 130 and 170 lbf.in. (1.47 and 1.58 m.daN).
(19)Connect tube assembly (24) to 45 degree elbow (2). TORQUE tube coupling nut to between 200 and 210 lbf.in. (2.26 and 2.37 m.daN).
(20)Install the upper right nacelle cooling valve (27) with collars (7), pins (6) and washers (8). TORQUE pins to between 200 and 250 lbf.in. (2.26 and 2.82 m.daN).
(21)Install tee (10) and O-ring (5) into port of upper right nacelle cooling valve (27) with nut (4). TORQUE nut to between 130 and 140 lbf.in. (1.47 and 1.58 m.daN).
(22)Connect tube assemblies (24 and 26) to tee (10). TORQUE tube coupling nuts to between 200 and 210 lbf.in. (2.26 and 2.37 m.daN).
(23)Attach tube assembly (24) to bracket on TCC duct with clamp (16), screw (13), washer (15), and nut (14). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(24)Attach tube assembly (24) to bracket on air duct with clamp (16), screw (13), washer (15), and nut (14). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(25)Install solenoid valve (30) on bracket at top of the thrust reverser door with three bolts (21) and washers (22). TORQUE bolts to between 50 and 70 lbf.in. (0.57 and 0.75 m.daN).
(26)Install 90 degree elbow (18) in port on forward side of the solenoid valve (30) with O-ring (5) and nut (4). TORQUE nut to between 130 and 140 lbf.in. (1.47 and 1.58 m.daN).
(27)Connect tube assembly (26) to 90 degree elbow (18). TORQUE tube coupling nut to between 200 and 210 lbf.in. (2.26 and 2.37 m.daN).
(28)Connect tube assembly (26) to tube assembly (24). TORQUE tube coupling nut to between 200 and 210 lbf.in. (2.26 and 2.37 m.daN).
(29)Attach tube assembly (24) to bracket on thrust reverser door with clamp

(16), screw (13), washer (14), and nut (14). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(30) Install 90 degree elbow (18) in port on aft side of the solenoid valve (30) with O-ring (5) and nut (4). TORQUE nut to between 130 and 140 lbf.in. (1.47 and 1.58 m.daN).

(31) Connect hose assembly (29) to 90 degree elbow (18). TORQUE hose coupling nut to between 170 and 240 lbf.in. (1.92 and 2.70 m.daN).

(32) Connect electrical connector DV230 to receptacle in solenoid valve. Tighten connector fingertight plus one-eighth turn. Lockwire connector.

E. Close-Up

(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2) Close the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(3) Remove safety clips and tags and close circuit breakers : 3KU.

(4) Remove access platform.

NACELLE CORE COMPARTMENT COOLING PNEUMATIC TUBING - REMOVAL/INSTALLATION

1. General

A. This procedure provides instructions for removal and installation of the nacelle core compartment cooling pneumatic tubing.

B. Access to the nacelle cooling system is through the left thrust reverser door. See 71-00-00, P. Block 301 for thrust reverser door opening and closing procedures.

2. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P06-020	Lubricants (Ref. 70-00-00)
B. Material No.P05-191	Special Materials (Ref. 70-00-00)
C.	Packing
- Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

3. Remove Cooling Valve Pneumatic Tubing (LH side)
(Ref. Fig. 401, 402, 403)

A. Job Set-Up
(1)Open safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Remove Tube Segment (1)
(1)Remove two screws (2), washers (3), nuts (4) and clamps (5) which attach tube segment (1) to clips (6) on inner barrel structure.
(2)Disconnect coupling nut of tube segment (1) from nacelle cooling valve (7).
(3)Disconnect coupling nut of tube segment (1) from reducer (8) and remove tube segment.

C. Remove union (9) and packing (10) from valve. Discard packing.

D. Remove Tube Segment (11)
(1)Remove 5 screws (2), washers (3), nuts (4) and clamps (5) attaching tube segment (11) clips on inner barrel structure.
(2)Disconnect coupling nut of tube segment (11) from union (12) and remove tube segment (11).
(3)Remove reducer (8) from tube segment.

E. Remove Tube Segment (13)
(1)Disconnect coupling nut of tube segment (13) from union (14).
(2)Remove screw (2), washer (3) nut (4) and clamp (5) attaching tube segment (13) to inner barrel structure and remove tube segment.
(3)Remove union (12) from tube segment (13).

F. Remove Tube Segment (15)
(1)Disconnect coupling nut of tube segment (15) from elbow (16).
(2)Remove bolt (17), washer (3), nut (4) and clamp (5) attaching tube segment (15) to bracket (18) and remove tube.
(3)Remove union (14) from tube segment (15).

G. Remove nut (19) and elbow (16) from bracket (20).

4. Install Cooling Valve Pneumatic Tubing (LH Side)
(Ref. Fig. 401, 402, 403)

A. Install Tube Segment (1)
(1)Apply anti-seize compound Material No.P06-020 to threads of union (9) and install union and packing (10) in cooling valve (7). TORQUE union to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN).
(2)Apply anti-seize compound Material No.P06-020 to threads of reducer (8) and install in coupling nut of tube segment (1). Tighten coupling fingertight.
(3)Apply anti-seize compound Material No.P06-020 to coupling nut threads of tube segment (1) and install on union (9) in valve. Tighten coupling nut fingertight.
(4)Position two clamp assemblies (5) onto tube segment (1) and install on clips (6) with screws (2), washers (3) and nuts (4). Tighten nuts (4) fingertight.

B. Install Tube Segment (11)
(1)Apply anti-seize compound Material No.P06-020 to threads of union (12) and install in coupling nut of tube segment (11). Tighten coupling nut fingertight.
(2)Apply anti-seize compound Material No.P06-020 to coupling nut threads of tube segment (11) and install tube on reducer (8). Tighten coupling nut fingertight.
(3)Position five clamp assemblies (5) onto tube segment (11) and install on clips with screws (2), washers (3) and nuts (4). Tighten nuts (4) fingertight.

C. Install Tube Segment (13)
(1)Apply anti-seize compound Material No.P06-020 to threads of union (14) and install on coupling nut of tube segment (13). Tighten coupling nut fingertight.
(2)Spiral wrap tube segment (13) with thermal insulating tape Material No.P05-191. Apply anti-seize compound Material No.P06-020 to threads of union (12) and install in coupling nut of tube segment (13). Tighten union fingertight.
(3)Install clamp (5) on tube segment (13) and attach to clip with screw (2), washer (3) and nut (4). Tighten nut fingertight.

D. Install Tube Segment (15)
(1)Apply anti-seize compound Material No.P06-020 to threads of coupling nut of tube segment (15) and install on union (14). Tighten coupling nut fingertight.

(2)Put clamp assembly (5) on tube segment and attach clamp to bracket (18) with bolt (17), washer (3) and nut (4). Tighten nut fingertight.

E. Install Elbow (16)
(1)Install elbow (16) on bracket with nut (19). TORQUE nut to between 130 and 140 lbf.in. (1.47 and 1.58 m.daN).
(2)Apply anti-seize compound Material No.P06-020 to threads of coupling nut of tube segment (15) and install on elbow (16). Tighten coupling nut fingertight.

F. TORQUE coupling nuts of tube segment (1) to between 135 and 150 lbf.in. (1.53 and 1.69 m.daN).

G. TORQUE coupling nuts of tube segments (11), (13) and (15) to between 170 and 200 lbf.in. (1.92 and 2.26 m.daN).

H. TORQUE clamp screws (2) and (17) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

I. Close-Up
(1)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

5. Remove Cooling Valve Pneumatic Tubing (RH Side) (Ref. Fig. 404)

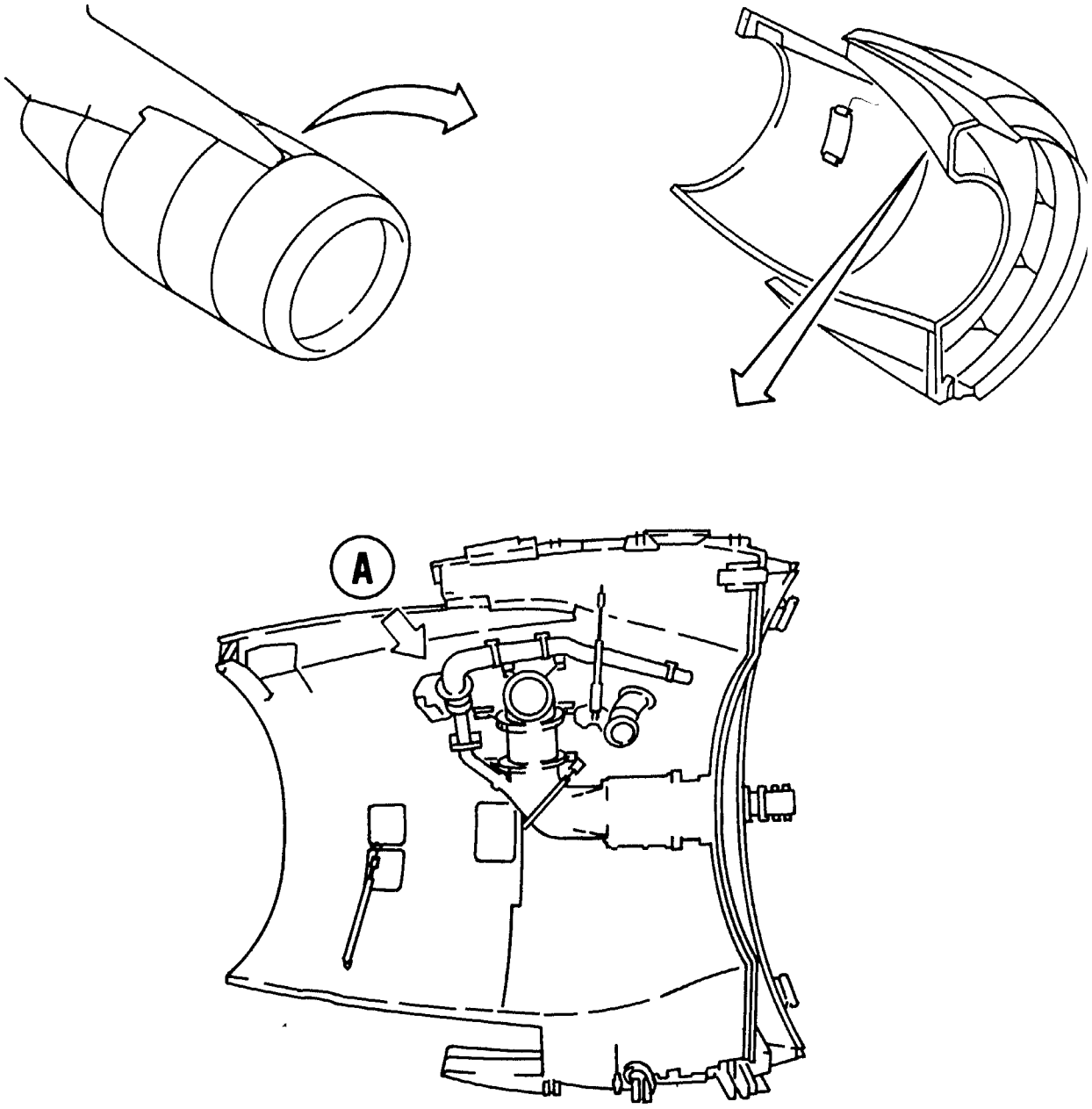
A. Job Set-Up
(1)Open safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Remove Tube Segment (1)
(1)Remove screws (2), washers (3), nut (4) and clamps (5) which attach tube segment (1) to clip on inner barrel structure.
(2)Disconnect coupling nut of tube segment (1) from nacelle cooling valve (6).
(3)Disconnect coupling nut of tube segment (1) from reducer (7) and remove tube segment.

C. Remove union (8) and packing (9) from valve. Discard packing.

D. Remove Tube Segment (10)
(1)Remove screw (2), washer (3), nut (4) and clamp (5) attaching tube segment (10) clip on inner barrel structure.
(2)Disconnect coupling nut of tube segment (10) from union (11) and remove tube segment (10).
(3)Remove reducer (7) from tube segment.

E. Remove Tube Segment (12).
(1)Disconnect coupling nut of tube segment (12) from elbow (13).
(2)Remove screw (2), washer (3) nut (4) and clamp (5) attaching tube segment (12) to bracket (14) and remove tube segment.
(3)Remove union (11) from tube segment (13).



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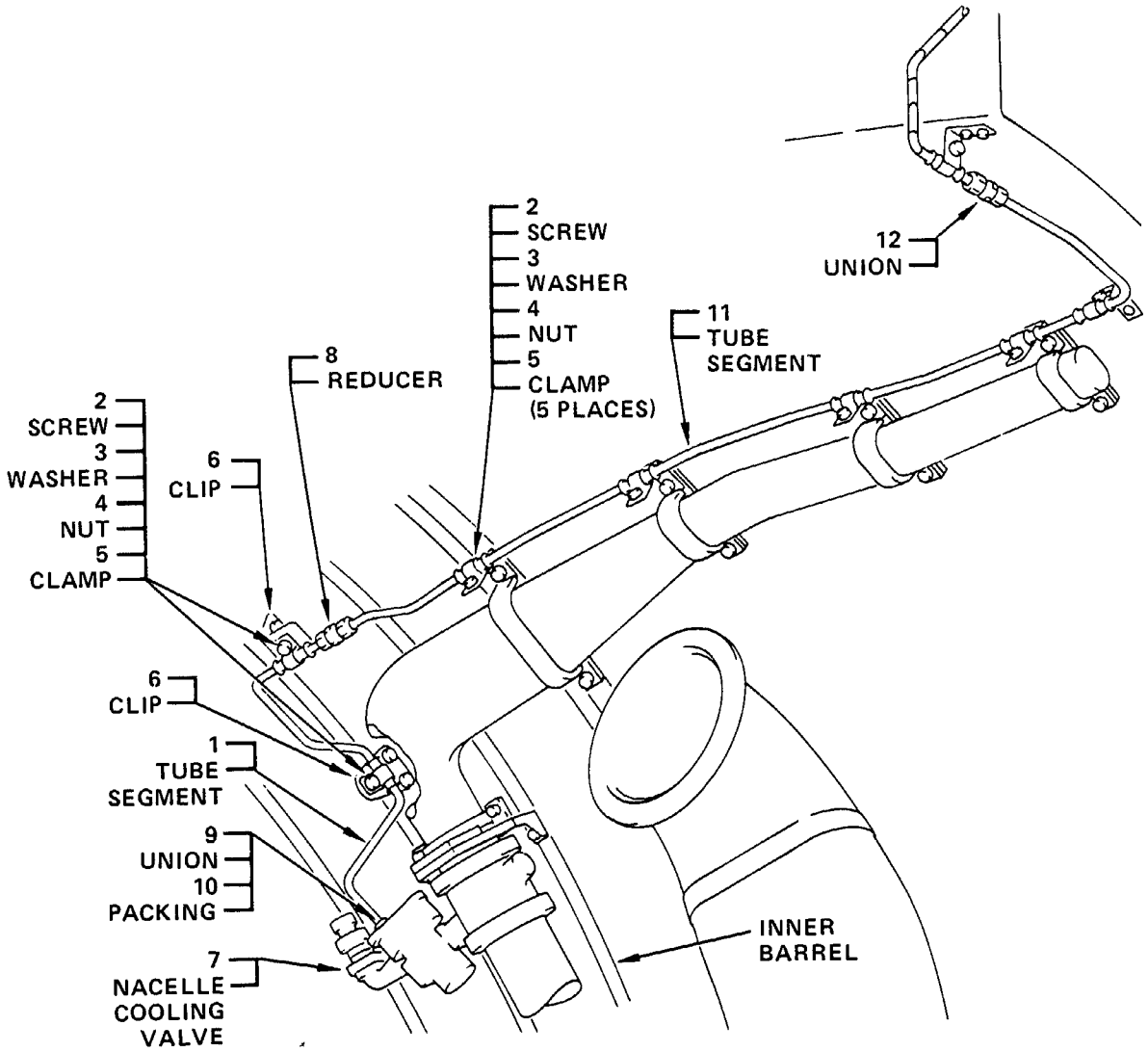
Nacelle Cooling Valve Pneumatic Tubes (LH Side)
Figure 401



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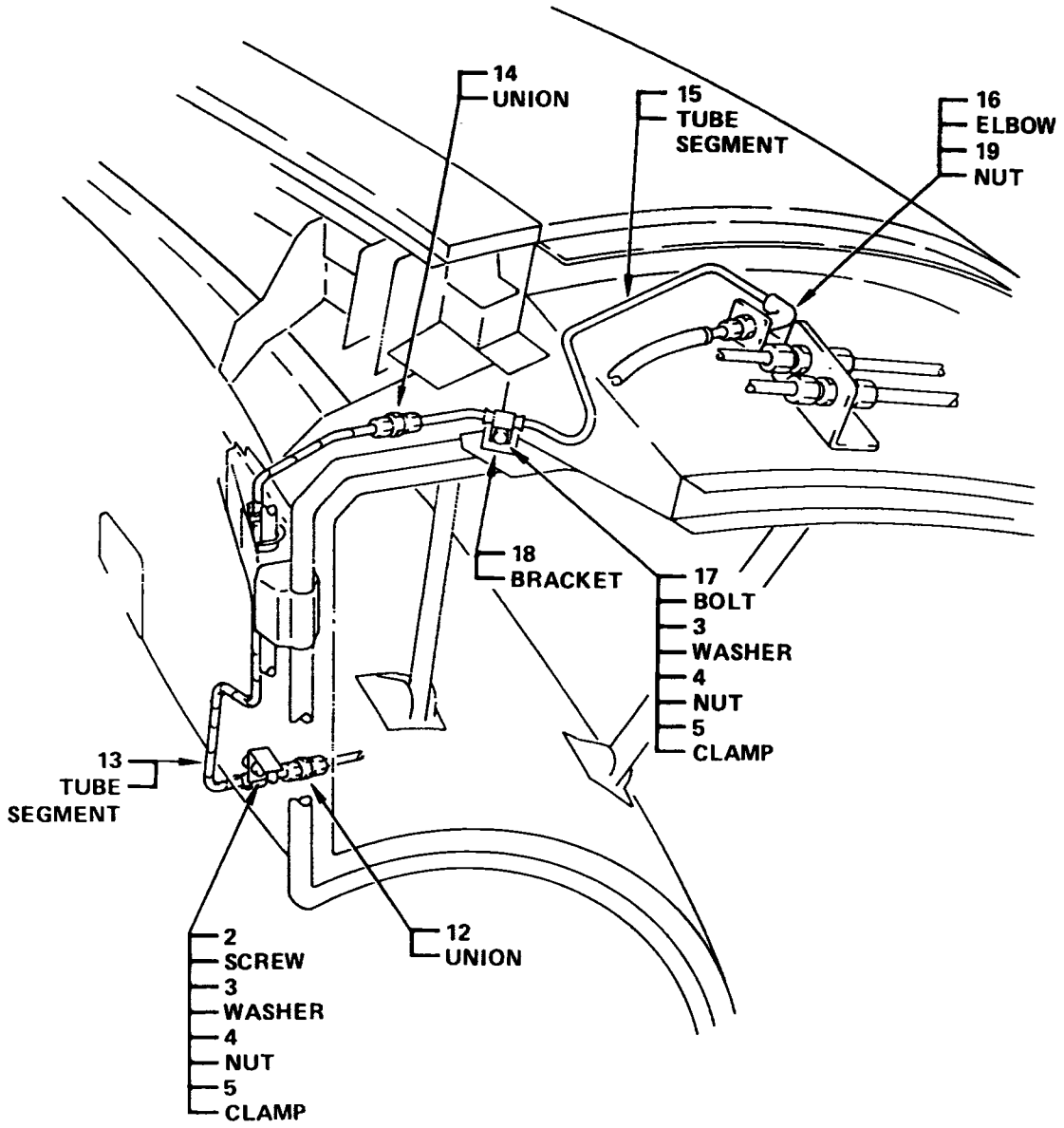
Nacelle Cooling Valve Pneumatic Tubes (LH Side)
Figure 402



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Nacelle Cooling Valve Pneumatic Tubes (LH Side)
Figure 403

F. Disconnect coupling of hose (15) and remove nut (16) and elbow (13) from bracket (17).

6. Install Cooling Valve Pneumatic Tubing. (RH Side) (Ref. Fig. 404)

A. Install Tube Segment (1)
(1)Apply anti-seize compound Material No.P06-020 to threads of union (8) and install union and packing (9) in cooling valve (6). TORQUE union to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN).
(2)Apply anti-seize compound Material No.P06-020 to threads of reducer (7) and install in coupling nut of tube segment (1). Tighten coupling nut fingertight.
(3)Apply anti-seize compound Material No.P06-020 to coupling nut threads of tube segment (1) and install on union (8) in valve. Tighten coupling nut fingertight.
(4)Position two clamp assemblies (5) onto tube segment (1) and install on clips with screws (2), washers (3) and nuts (4). Tighten nuts (4) fingertight.

B. Install Tube Segment (10)
(1)Apply anti-seize compound Material No.P06-020 to threads of union (11) and install in coupling nut of tube segment (10). Tighten coupling nut fingertight.
(2)Spiral wrap tube segment (10) with thermal insulating tape Material No.P05-191. Apply anti-seize compound Material No.P06-020 to coupling nut threads of tube segment (10) and install tube on reducer (7). Tighten coupling nut fingertight.
(3)Position clamp assembly (5) onto tube segment (10) and install on clip with screw (2), washer (3) and nut (4). Tighten nut (4) fingertight.

C. Install Tube Segment (12)
(1)Apply anti-seize compound Material No.P06-020 to threads of coupling nut of tube segment (12) and install on union (13). Tighten coupling nut fingertight.
(2)Put clamp assembly (5) on tube segment and attach clamp to bracket (14) with screw (2), washer (3) and nut (4). Tighten nut fingertight.

D. Install Elbow (13).
(1)Install elbow (13) on bracket (17) with nut (16). TORQUE nut to between 130 and 140 lbf.in. (1.47 and 1.58 m.daN)
(2)Apply anti-seize compound Material No.P06-020 to threads of coupling nut of tube segment (12) and install on elbow (13). Tighten coupling nut fingertight.
(3)Apply anti-seize compound Material No.P06-020 to threads of coupling nut of hose (15) and install on elbow (13). Tighten coupling nut fingertight.

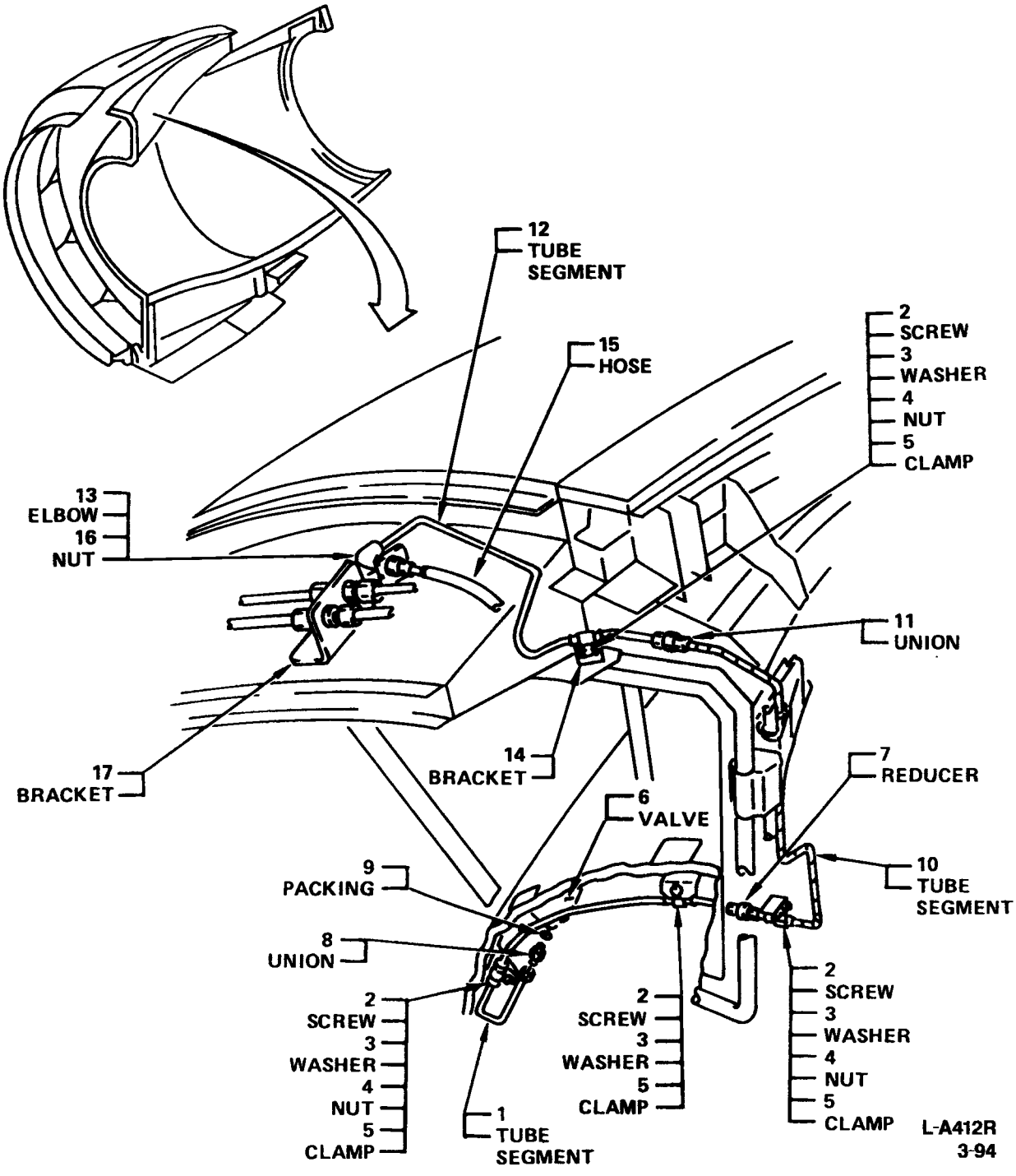
E. TORQUE coupling nuts of tube segment (1) to between 135 and 150 lbf.in. (1.53 and 1.69 m.daN).

F. TORQUE coupling nuts of tube segments (10) and (12) and hose (15) to

between 170 and 200 lbf.in. (1.92 and 2.26 m.daN).

G. TORQUE clamp screws (2) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

H. Close-Up.
(1)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



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Nacelle Cooling Valve Pneumatic Tubes (RH Side)
Figure 404

NACELLE CORE COMPARTMENT COOLING ELECTRICAL HARNESS - REMOVAL/INSTALLATION

1. General

A. This procedure provides instructions for removal and installation of the nacelle core compartment cooling electrical harness.

B. Access to the nacelle cooling system is through the left thrust reverser door. See 71-13-00, P. Block 301 for thrust reverser door opening and closing procedures.

2. Equipment and Materials

ITEM	DESIGNATION
A.	Packing
B.	Circuit Breaker Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

3. Remove Wire Harness 21W4082 (LH Side)

A. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75

(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401, 402, 403)
(1)Remove 4 screws (1) and seal block cover (2) from seal block.
(2)Remove nut (3) and washer (4) from support bracket and disconnect ground lead (5) from nacelle cooling valve (6) and bracket.
(3)Disconnect DV227 connector (7) from nacelle cooling valve (6).
(4)Remove 18 screws (8), nuts (9) and clamps (10) attaching 21W4082 wire harness (13) to tube segments (11) and (12).
(5)Remove screws (14) and clamps (15) attaching wire harness (13) to support bracket (16).
(6)Remove screws (14) and clamps (15) and nuts (26) attaching wire harness (13) to tube segments (17) and (18).
(7)Remove screws (19) and clamps (20) attaching 21W4082 wire harness (13), 21W4148 wire harness (21) and 21W4146 wire harness (22) to support bracket (23).
(8)Disconnect D4986P electrical connector (24) from D4986J electrical connector (25).

C. Installation (Ref. Fig. 401, 402, 403)
(1)Attach D4986P electrical connector (24) to D4986J electrical connector (25). Tighten connector fingertight plus one-eighth turn.

(2)Position clamps (20) over 21W4082 wire harness (13), 21W4148 wire harness (21) and 21W4146 wire harness (22) and attach clamps to brackets (23) with screws (19).
Tighten screws fingertight.
(3)Route 21W4082 wire harness (13) along pneumatic tube segments (18) and (17) and attach harness to clips with clamps (15), screws (14) and nuts (26). Tighten nuts fingertight.
(4)Attach 21W4082 wire harness (13) to wire harness support bracket (16) with two clamps (15) and screws (14). Tighten screws fingertight.
(5)Route 21W4082 wire harness (13) aft along pneumatic tube segments (12) and (11) and attach harness to clips with 18 clamps (10), screws (8) and nuts (9). Tighten nuts fingertight.
(6)Connect DV227 connector (7) on wire harness (13) to nacelle cooling valve (6) fingertight plus one-eighth turn.
(7)Attach ground lead (5) on wire harness (13) to valve (6) and bracket with nut (3) and washer (4). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(8)Adjust slack on 21W4082 wire harness (13). TORQUE clamp screws (8) and (14) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(9)Attach seal block cover (2) to seal block on inner barrel with 4 screws (1). TORQUE screws to between 12 and 15 lbf.in. (0.14 and 0.17 m.daN).

D. Close-Up
(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove safety clips and tags and close circuit breakers : 3KU.

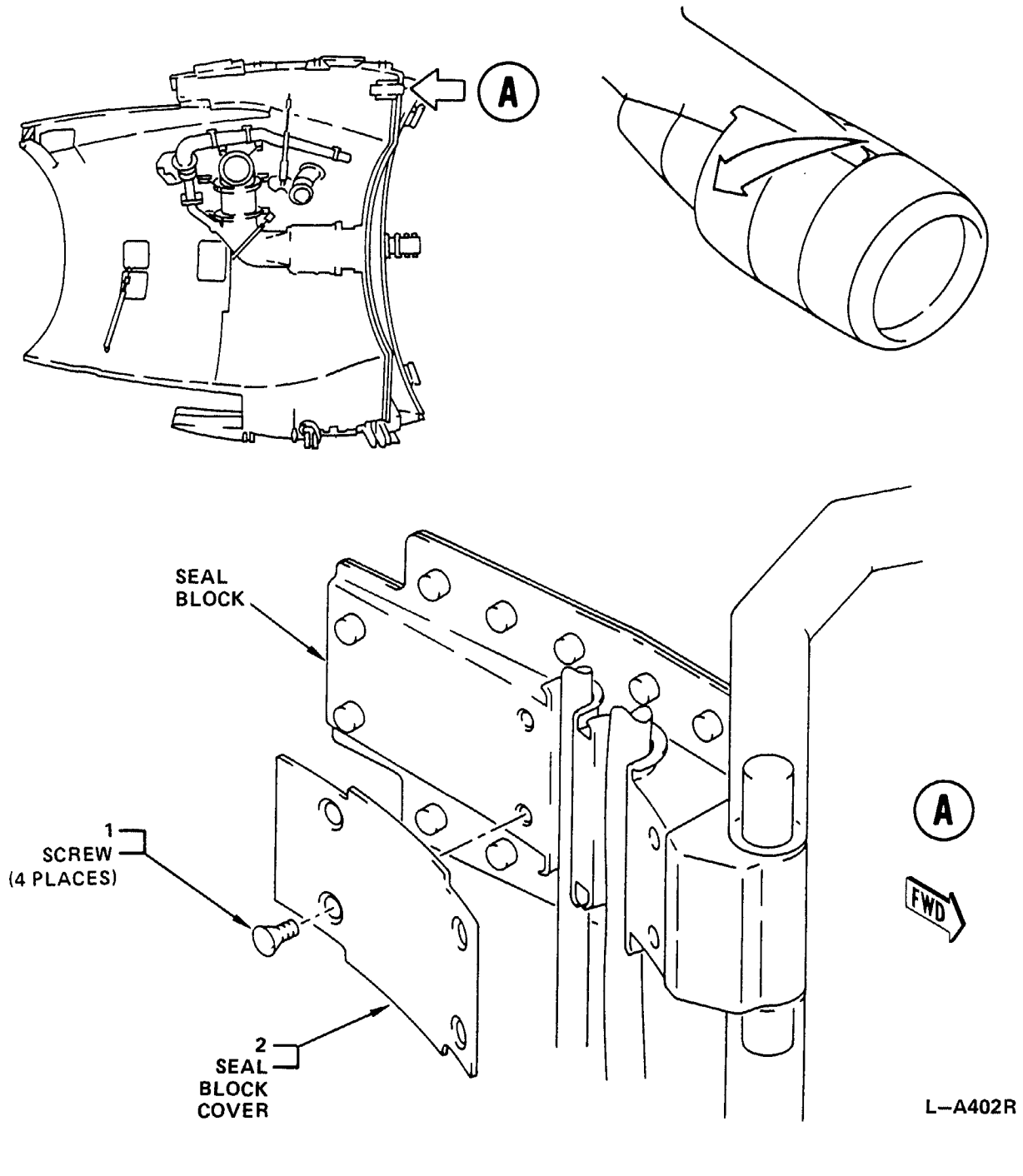
4. Remove Wire Harness 21W4080 (RH Side)

A. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

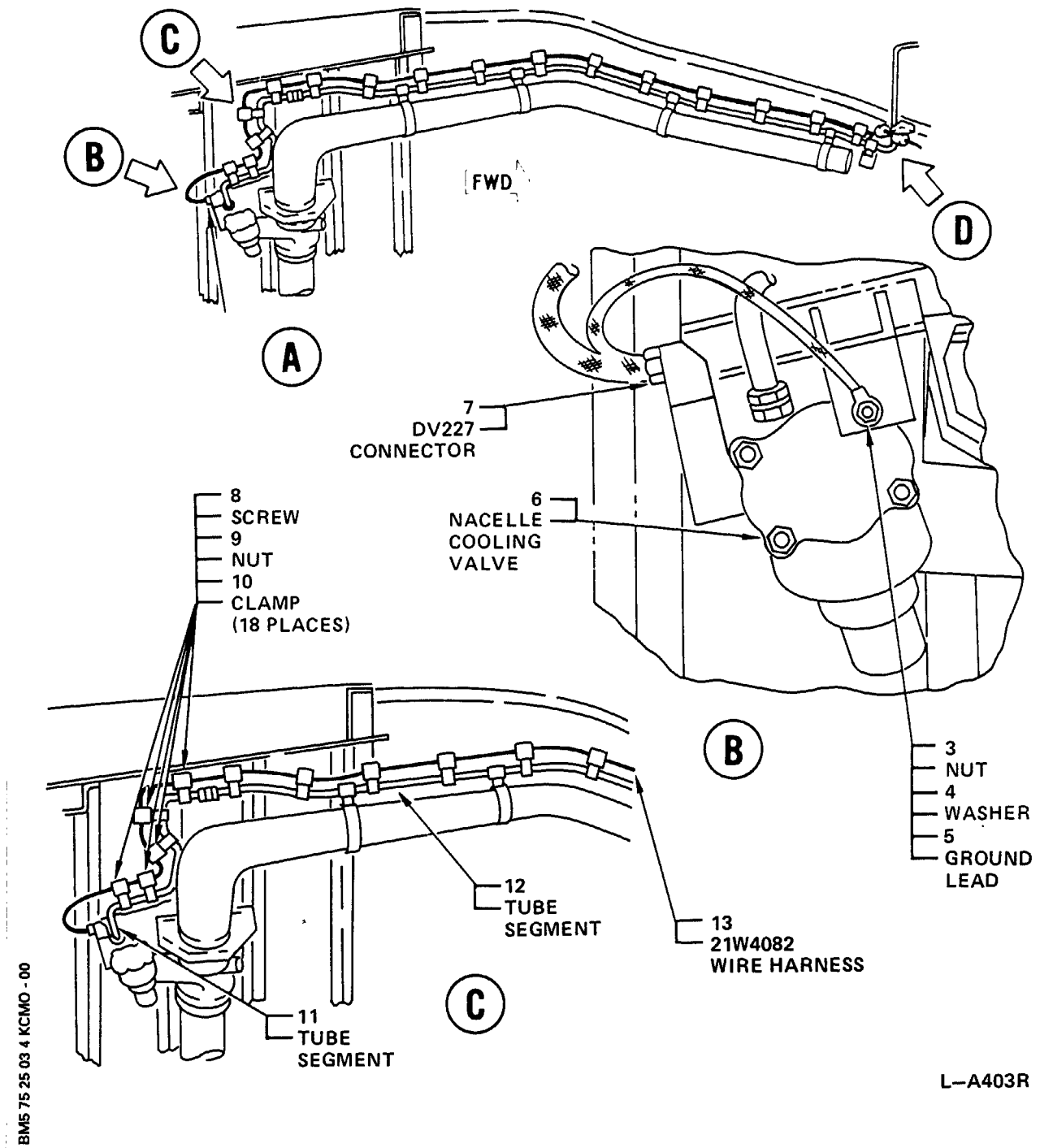
PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75

(2)Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

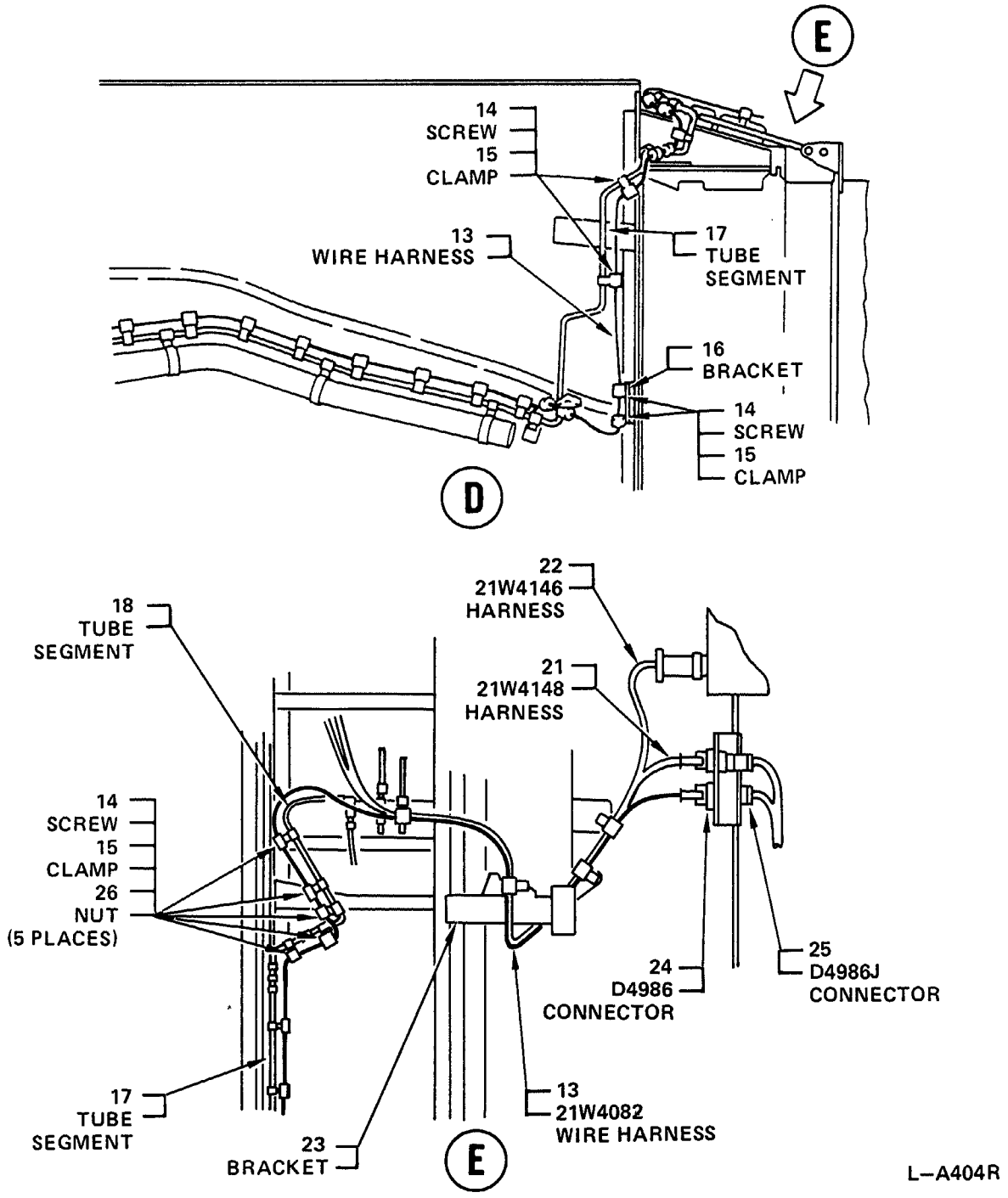
B. Removal (Ref. Fig. 404, 405, 406)
(1)Remove 4 screws (2) and seal block cover (3) from seal block.
(2)Remove nut (4) and washer (5) from support bracket (6) and disconnect ground lead (7) from nacelle cooling valve (8) and bracket.
(3)Disconnect DV228 connector (9) from nacelle cooling valve (8).
(4)Remove 6 screws (10) and clamps (11) attaching 21W4080 wire harness (1) to inner barrel surface and bracket (12).
(5)Remove 2 screws (10), nuts (13) and clamps (11) attaching wire harness (1) to tube segment (14).
(6)Remove 5 screws (10), nuts (13) and clamps (11) attaching wire harness (1) to tube segment (15).
(7)Remove 5 screws (16), nuts (17) and clamps (18) attaching 21W4080 wire harness (1), 21W4152 wire harness (19) and 21W4144 wire harness (20)



Wire Harness 21W3077 (LH Side)
Figure 401



Wire Harness 21W3077 (LH Side)
Figure 402



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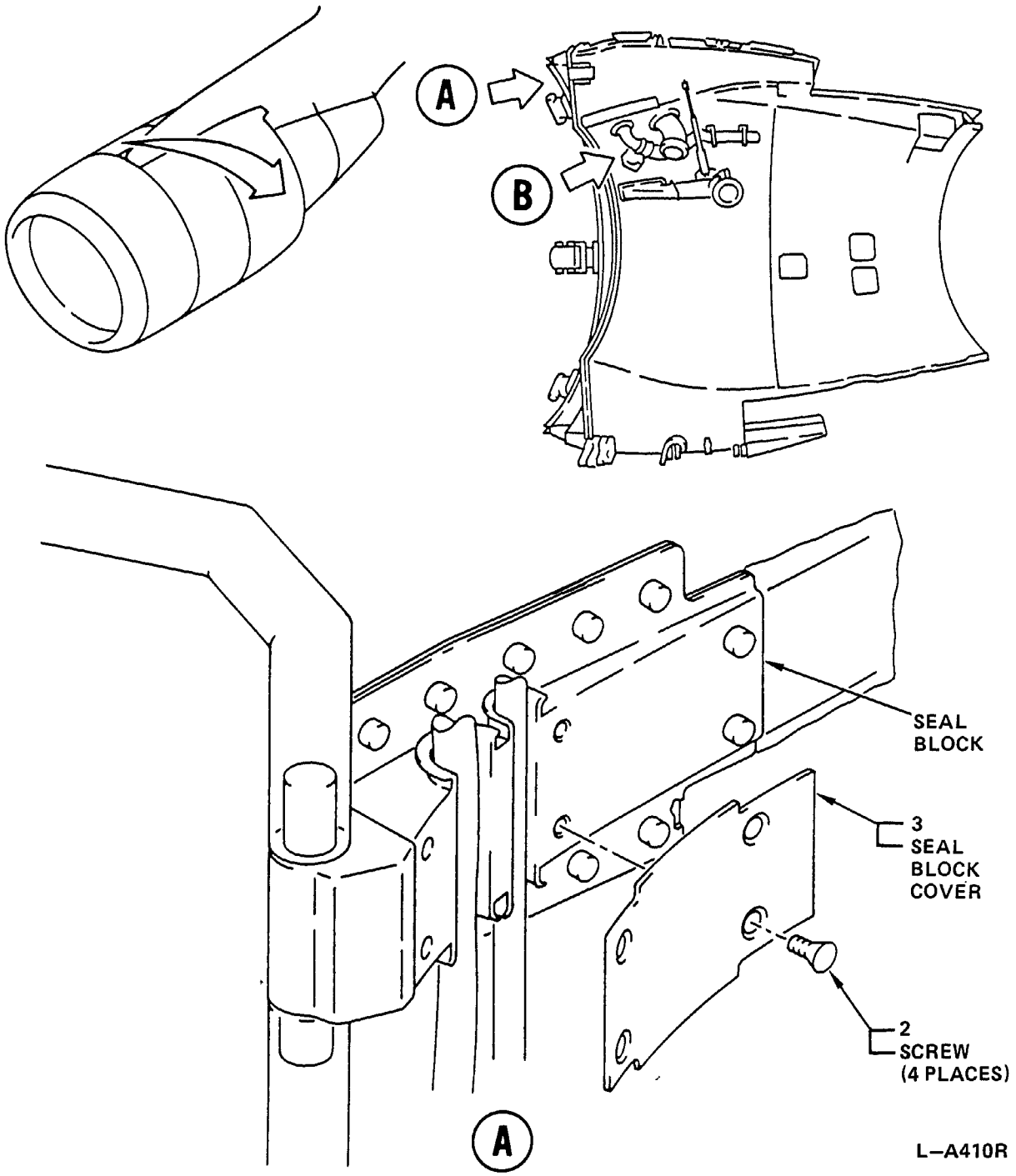
Wire Harness 21W3077 (LH Side)
Figure 403

to support bracket (21).
(8)Disconnect D4987P electrical connector (22) from D4987J connector (23).

C. Installation (Ref. Fig. 404, 405, 406)
(1)Attach D4987P connector (22) to D4987J connector (23) on thrust reverser. Tighten connector fingertight plus one-eighth turn.
(2)Position 5 clamps (18) over 21W4080 wire harness (1), 21W4152 wire harness (19) and 21W4144 wire harness (20) and attach clamps to support brackets (21) with screws (16) and nuts (17). Tighten screws fingertight.
(3)Route 21W4080 wire harness (1) along pneumatic tube segment (15) and attach harness to five clips with clamps (11), screws (10) and nuts (13). Tighten nuts fingertight.
(4)Route 21W4080 wire harness (1) down along pneumatic tube segment (14) and through seal block and attach harness to two clips with clamps (11), screws (10) and nuts (13). Tighten nuts fingertight.
(5)Install wire harness (1) on clips on inner barrel structure and support bracket (12) with 6 clamps (11), and screws (10). Tighten screws fingertight.
(6)Connect DV228 connector (9) on wire harness (1) to nacelle cooling valve (8) fingertight plus one-eighth turn.
(7)Remove nut (4) and washer (5) and attach ground lead (7) to valve (8) and bracket with nut (4) and washer (5). TORQUE nut (4) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(8)Adjust slack on 21W4080 wire harness (1). TORQUE clamp screws (14) and (17) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(9)Attach seal block cover (3) to seal block on inner barrel with 4 screws (2). Torque screws to between 12 and 15 lbf.in. (0.14 and 0.17 m.daN).

D. Close-Up
(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove safety clips and tags and close circuit breaker : 3KU.



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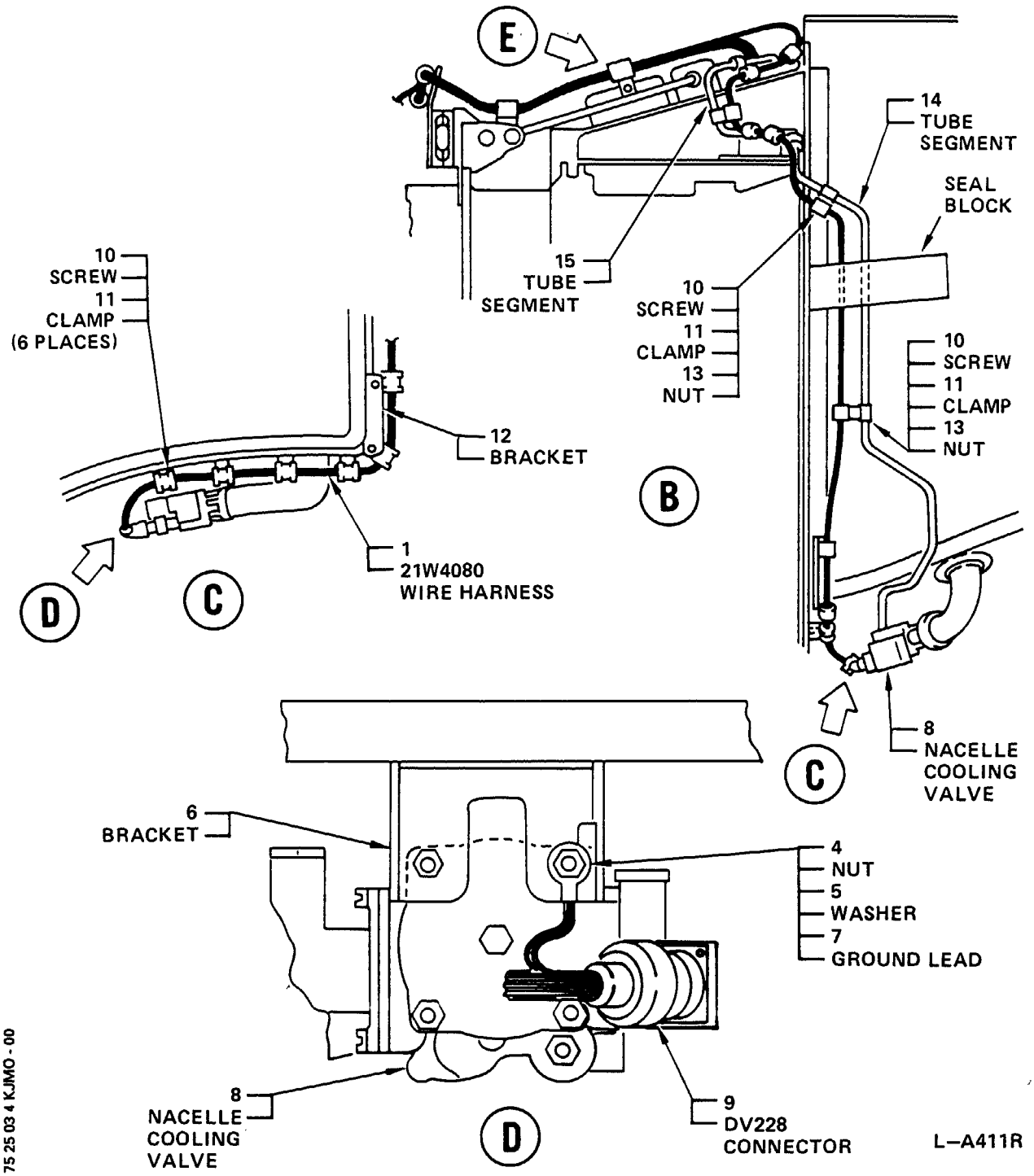
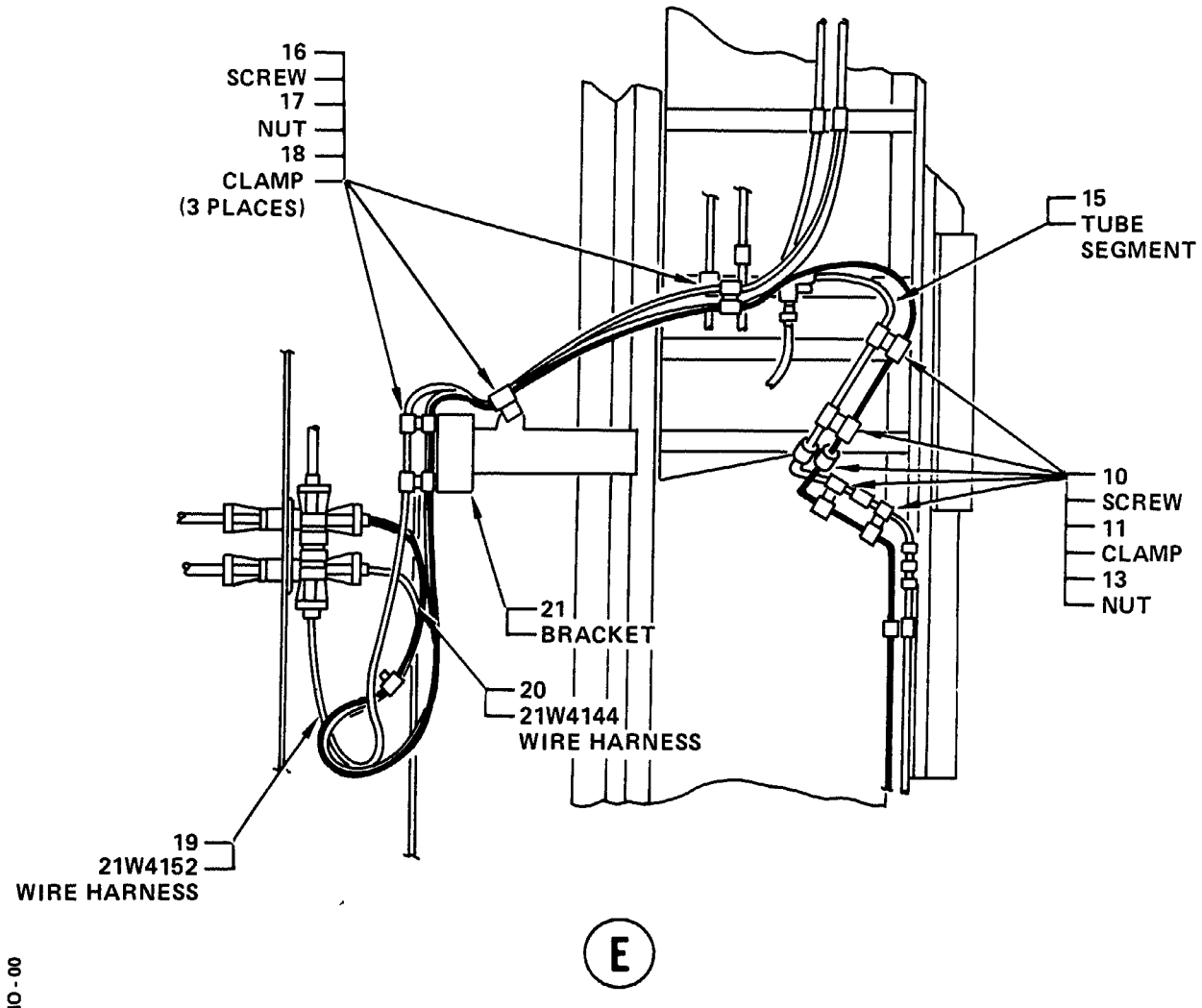
Wire Harness 21W3077 (RH Side)
Figure 404



Wire Harness 21W3077 (RH Side)
Figure 405



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Wire Harness 21W3077 (RH Side)
Figure 406

R

NACELLE COOLING BAROMETRIC SWITCH - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Access Platform
B.	Protective Cover
C.	Safety Clips
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-25-00, P. Block 501	Nacelle Core Compartment Coding System

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the following circuit breaker :

PANEL	SERVICE	IDENT.	LOCATION
123VU	HYDR-NACELLE COOLING ENG 1 AND 2	3KU	302/Q75

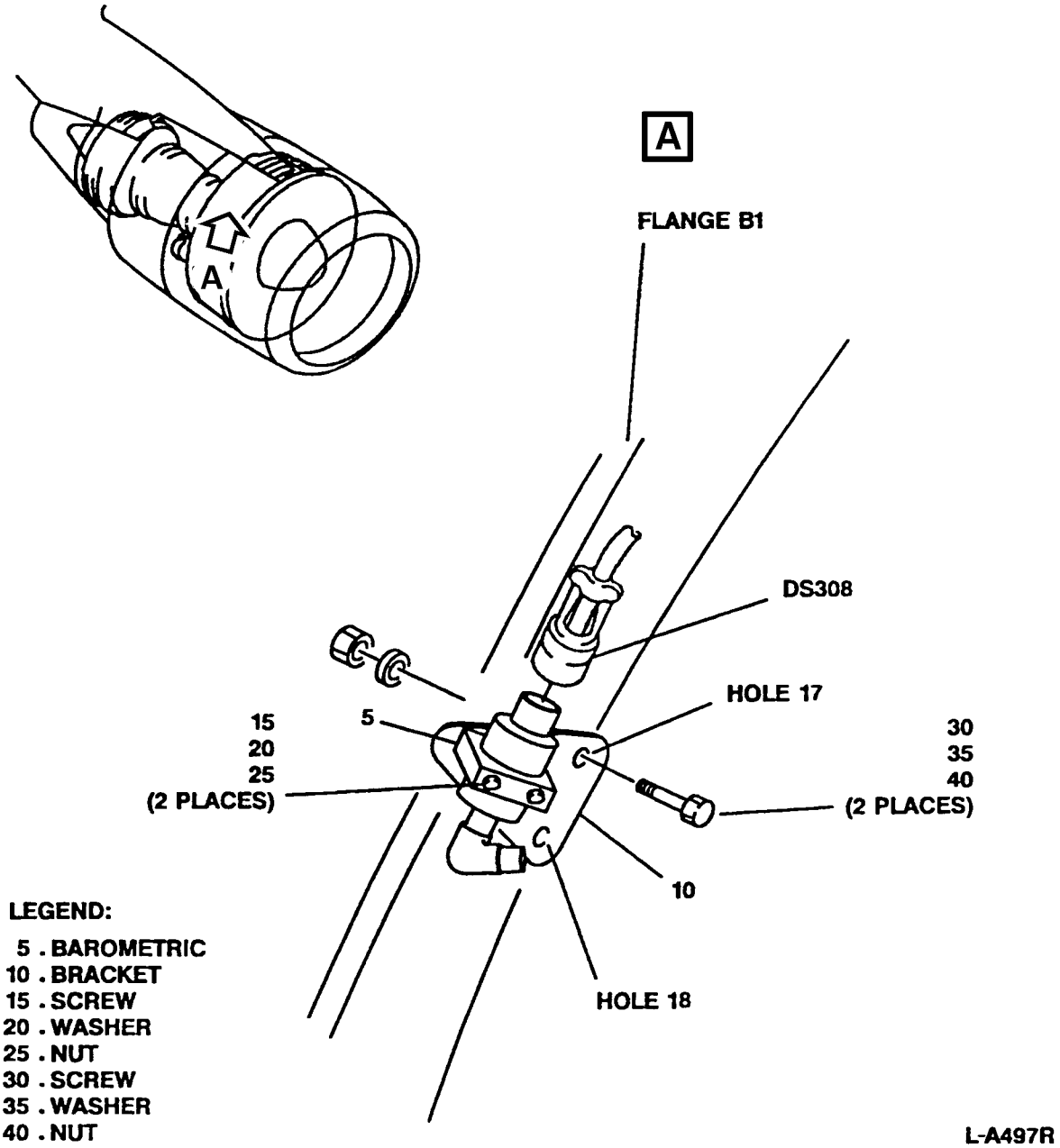
(2)Open the right hand fan cowl door (Ref. 71-13-00, P. Block 301).
(3)Put access platform in position.

B. Removal (Ref. Fig. 401)
(1)Disconnect electrical connector DS308. Install protective cover.
(2)Remove bracket (10), bolts (30), washers (35), and nuts (40) from right hand engine fan case.
(3)Remove barometric switch (5) from bracket (10). Remove bolts (15), washers (20) and nuts (25).

C. Installation (Ref. Fig. 401)
(1)Mount barometric switch (5) into bracket (10) with bolts (15), washers (20), and nuts (25). TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(2)Install bracket with barometric switch attached to forward side of engine flange B1 at holes 17 and 18 with bolts (30), washers (35), and nuts (40). TORQUE nuts to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN).
(3)Install electrical connector DS308 to barometric switch receptacle. Tighten connector fingertight plus one-eighth turn.

D. Test
(1)Perform a nacelle core compartment cooling system test procedure (Ref. 75-25-00, P. Block 501).

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.



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Nacelle Cooling Barometric Switch
Figure 401

(2)Close right hand fan cowl door and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)Remove access platform.

OIL TRANSMITTER COOLING TUBES - REMOVAL/INSTALLATION

1. Procedure

NOTE : This procedure is only available on aircraft equipped with PHASE I configured engine.

A. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P06-002	Lubricants (Ref. 70-00-00)
B.	Corrosion Resistant Steel Lockwire (AS 3214-02) (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Thrust Reverser Cowl Doors

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

NOTE : This procedure is only available on aircraft equipped with PHASE III configured engine.

A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 71-13-00, P. Block 301	Thrust Reverser Cowl Doors

**ON A/C 101-200,

B. Job Set-Up

(1)Open the left thrust reverser door (Ref. 71-13-00, P. Block 301).

C. Removal

(Ref. Fig. 401)

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

(Ref. Fig. 402)

**ON A/C 101-200,

(1)Loosen coupling nut attaching cooling tube (1) to nipple on cooling tube

(2).
(2)Disconnect clamps (4) attaching hose (3) to oil tank cooling shroud and cooling tube (1).
(3)Remove nuts (7), washers (6), screws (5) and clamps (8).
Remove cooling tube (1) from engine.
(4)Remove hose (3) from cooling tube (1).
(5)Remove wirelock and loosen connector (10) attaching cooling tube (2) to TRC valve. Discard packing (14), but retain snap ring retainer (16) and washers (15).
(6)Remove clamps (12) and (13) and disconnect hose (11) from tube (2) and cooling air supply tube.
(7)Remove nuts (7), washers (6), screws (5) and clamps (9).
(8)Remove tube (2) from engine.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

(1)Loosen coupling nut attaching cooling tube (4) to cooling tube (3).
(2)Remove clamps (6) attaching hose (5) to oil tank cooling shroud and cooling tube (4).
(3)Remove nuts (12), washers (11), screws (10) and clamps (13).
Remove cooling tube (4) from engine.
(4)Remove hose (6) from cooling tube (4).
(5)Remove clamps (7) and (8) and remove hose (2) from tube (3) and cooling air supply tube.
(6)Remove nuts (12), washers (11), screws (10) and clamps (9).
(7)Remove tube (3) from engine.

**ON A/C 101-200,

D. Installation (Ref. Fig. 401)
(1)Lubricate packings (14) with Material No.P06-002.
Install connector (10) coupling body on tube (2) and coupling nut on LH TRC valve. Install washer (15) and packing (14) on coupling body using packings to retain washers (15).
Secure tube and TRC valve together with snap retainer (16).
Engage connector body and coupling nut threads and tighten fingertight.
(2)Connect hose (11) to cooling air supply tube and tube (2).
(3)Secure hose (11) with clamps (12) and (13). TORQUE both clamps to between 25 and 30 lbf.in. (0.28 and 0.34 m.daN).
(4)Attach tube (2) to brackets with clamps (9), screws (5), washers (6) and nuts (7). TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(5)TORQUE connector (10) to between 64.8 and 79.2 lbf.in. (0.73 and 0.89 m.daN) and wirelock.
(6)Loosely connect coupling nut on tube (1) to nipple on tube (2).
(7)Connect hose (3) to tube (1) and oil quantity transmitter cooling shroud with clamps (4).
(8)Attach tube (1) to brackets with clamps (8), screws (5), washers (6) and

nuts (7).
(9)TORQUE nuts (7) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
TORQUE clamps (4) to between 25 and 30 lbf.in. (0.28 and 0.34 m.daN).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

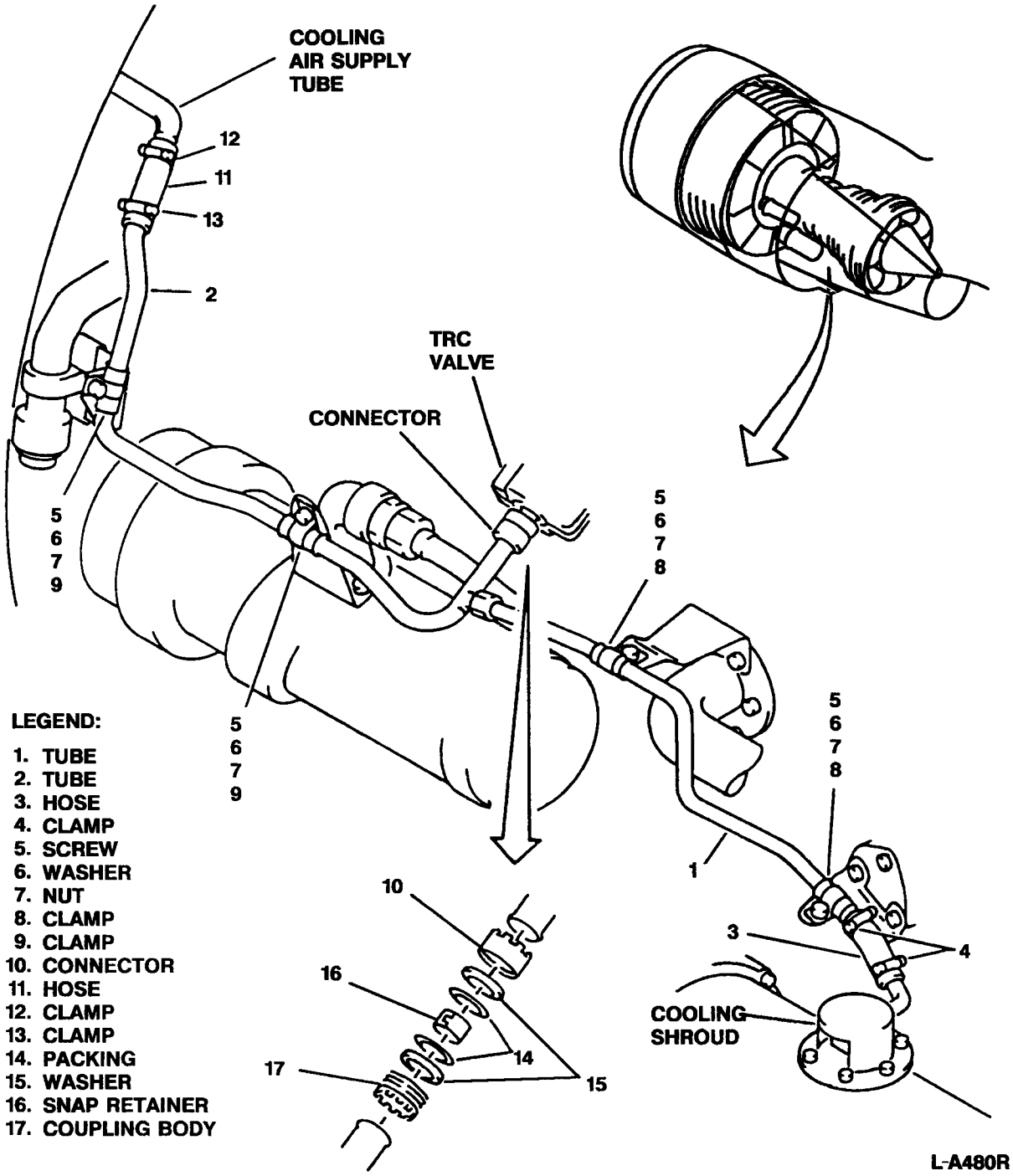
D. Installation (Ref. Fig. 402)
(1)Connect cooling air supply tube and cooling tube (3) with hose (2).
(2)Secure hose (2) with clamps (7) and (8) fingertight.
(3)Attach tube (3) to brackets with clamps (9), screws (10), washers (11) and nuts (12). TORQUE nuts to between 20 and 25 lbf.in. (0.28 and 0.34 m.daN).
(4)TORQUE clamps (7) and (8) to between 25 and 30 lbf.in. (0.28 and 0.34 m.daN).
(5)Loosely connect hose (5) to tube (4) and cooling shroud with clamps (6).
(6)Connect tube (4) to tube (3) with coupling nut. TORQUE coupling nut to between 500 and 520 lbf.in. (5.65 and 5.87 m.daN).
(7)Attach tube (4) to brackets with clamps (13), screws (10), washers (11) and nuts (12). TORQUE nuts (12) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(8)TORQUE clamps (6) to between 25 and 30 lbf.in. (0.28 and 0.34 m.daN).

**ON A/C 101-200,

E. Close-Up
(1)Close the left thrust reverser door (Ref. 71-13-00, P. Block 301).

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,



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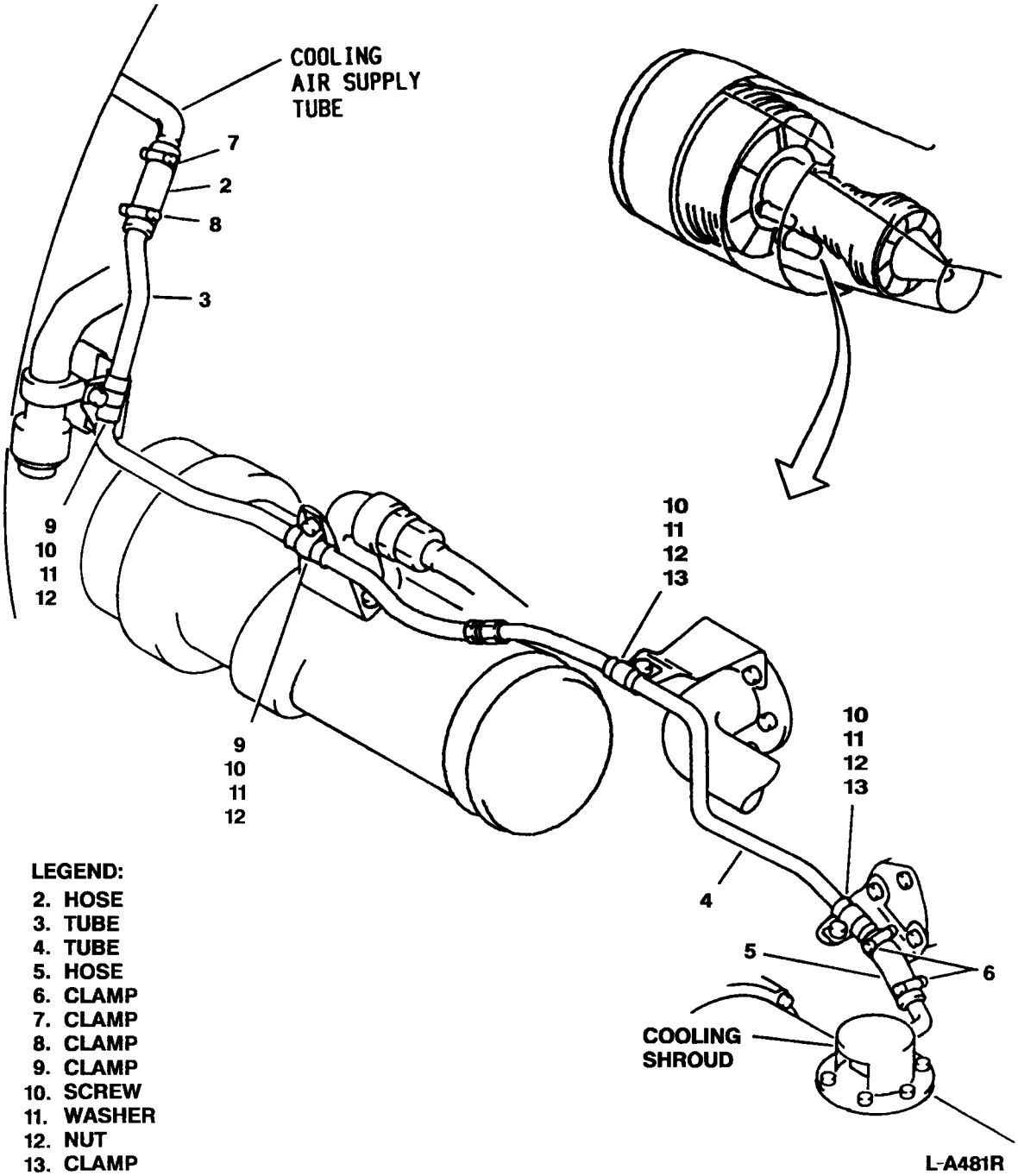
Oil Transmitter Cooling Tubes
Figure 401



LEGEND:

2. HOSE
3. TUBE
4. TUBE
5. HOSE
6. CLAMP
7. CLAMP
8. CLAMP
9. CLAMP
10. SCREW
11. WASHER
12. NUT
13. CLAMP

BM5 75 26 18 4 KCM0 00

Oil Transmitter Cooling Tubes
Figure 402

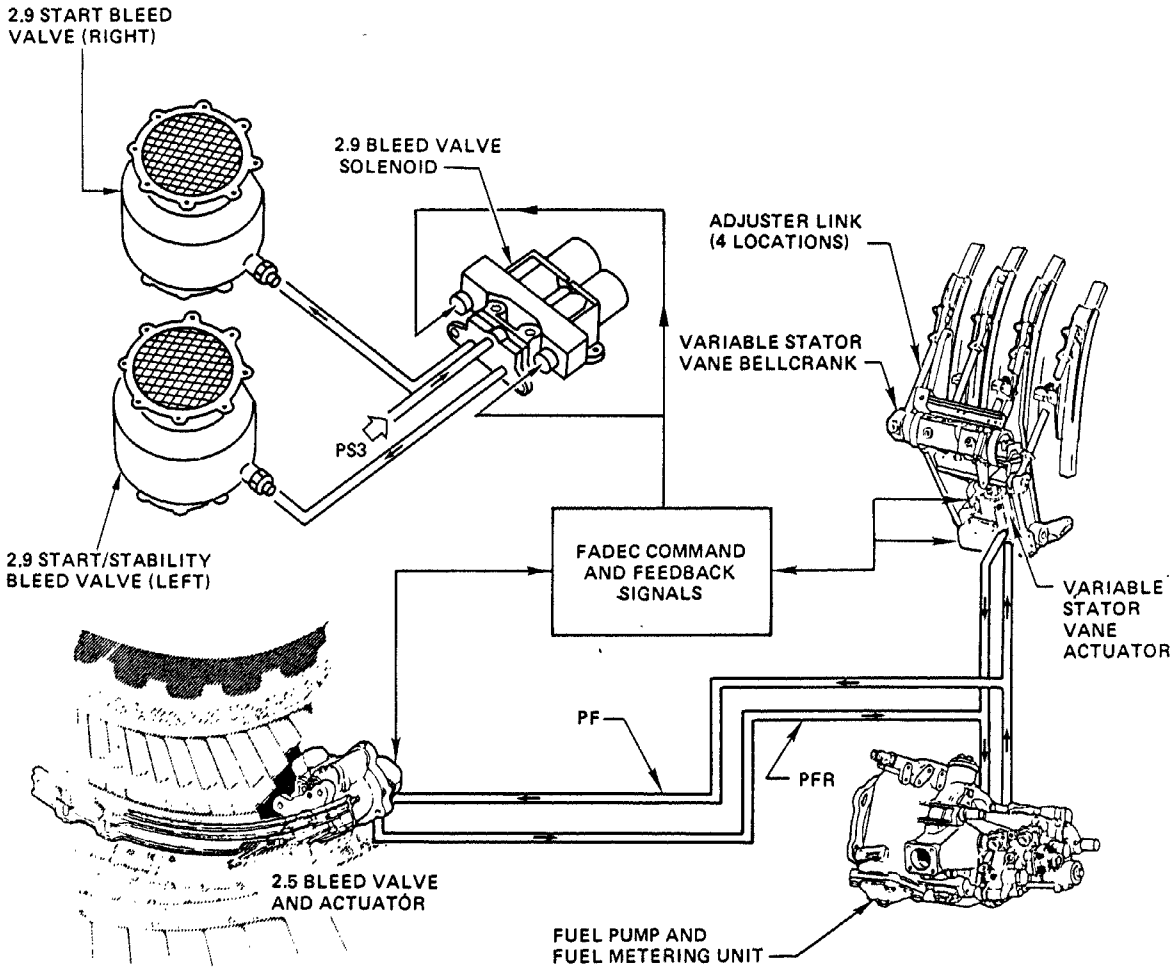
COMPRESSOR CONTROL - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
   The compressor control consists of :
   - a variable stator vane system operated by fuel pressure
   - a 2.5 bleed system operated by fuel pressure
   - a 2.9 bleed system powered by compressor discharge pressure
   - a thermatic rotor control system (TRC) powered by compressor discharge pressure.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

1. General (Ref. Fig. 001)
   The compressor control consists of :
   - a variable stator vane system operated by fuel pressure
   - a 2.5 bleed system operated by fuel pressure
   - a 2.9 bleed system powered by compressor discharge pressure



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Compressor Air Flow Control System
Figure 001

VARIABLE STATOR VANE CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

The variable vane system provides optimum engine performance throughout the engine operating envelope by varying compressor airflow. Fuel pressure from the FMU is used like hydraulic pressure to operate the stator vane actuator.

A. Description and Operation (Ref. Fig. 002)

(1) The stator vane actuator has three ports : fuel supply PF, fuel return PFR, and overboard drain (SD).
Variable geometry stator vanes are incorporated on the inlet guide vanes and the 5th, 6th and 7th stages of the high pressure compressor. Stator vane actuator position is scheduled as a function of low rotor speed (N1), high rotor speed (N2) and engine inlet total temperature (T2). The Full Authority Digital Engine Control (FADEC) interfaces with the stator vane actuator through a pilot valve positioned by a dual coil torque motor. Stator vane actuator position is sensed by dual, temperature compensated, linear variable differential transformers (LVDT) and fed back to the FADEC.

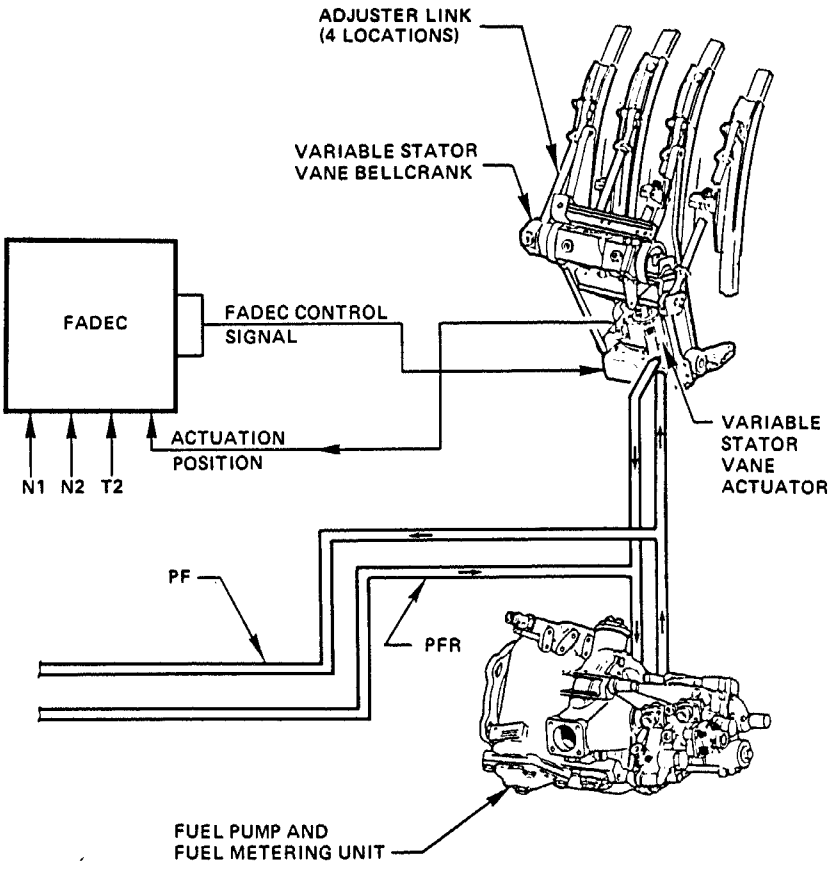
(2) The right pilot valve, torque motor and LVDT's are integral with the stator vane actuator. The actuator is powered by hydraulic pressure supplied by the fuel pumps.
The relative scheduling of the four stator vane stages is controlled by a fixed geometry linkage driven by the stator vane actuator. The actuator piston linear motion is transmitted to the variable vanes through a mechanical linkage which includes one bellcrank, 4 adjustable links (one per stage), 4 unison rings (one per stage), and 230 connector links (one per vane).

(3) At low engine RPM the variable vanes are positioned in the closed direction allowing minimal airflow through the compressor.
At high engine RPM the variable vanes are open allowing maximum airflow through the compressor. The vanes begin to close if an impending surge is detected by the FADEC.
In the event of loss of the electrical signal to the actuator the system is designed to open the vanes.

2. Component Location

(Ref. Fig. 003)

FIN	FUNCTIONAL DESIGNATION	PANEL	ZONE	ACCESS DOOR	ATA REF.
	ACTUATOR-VARIABLE STATOR VANE	454 464	452AR 462AR		75-31-03



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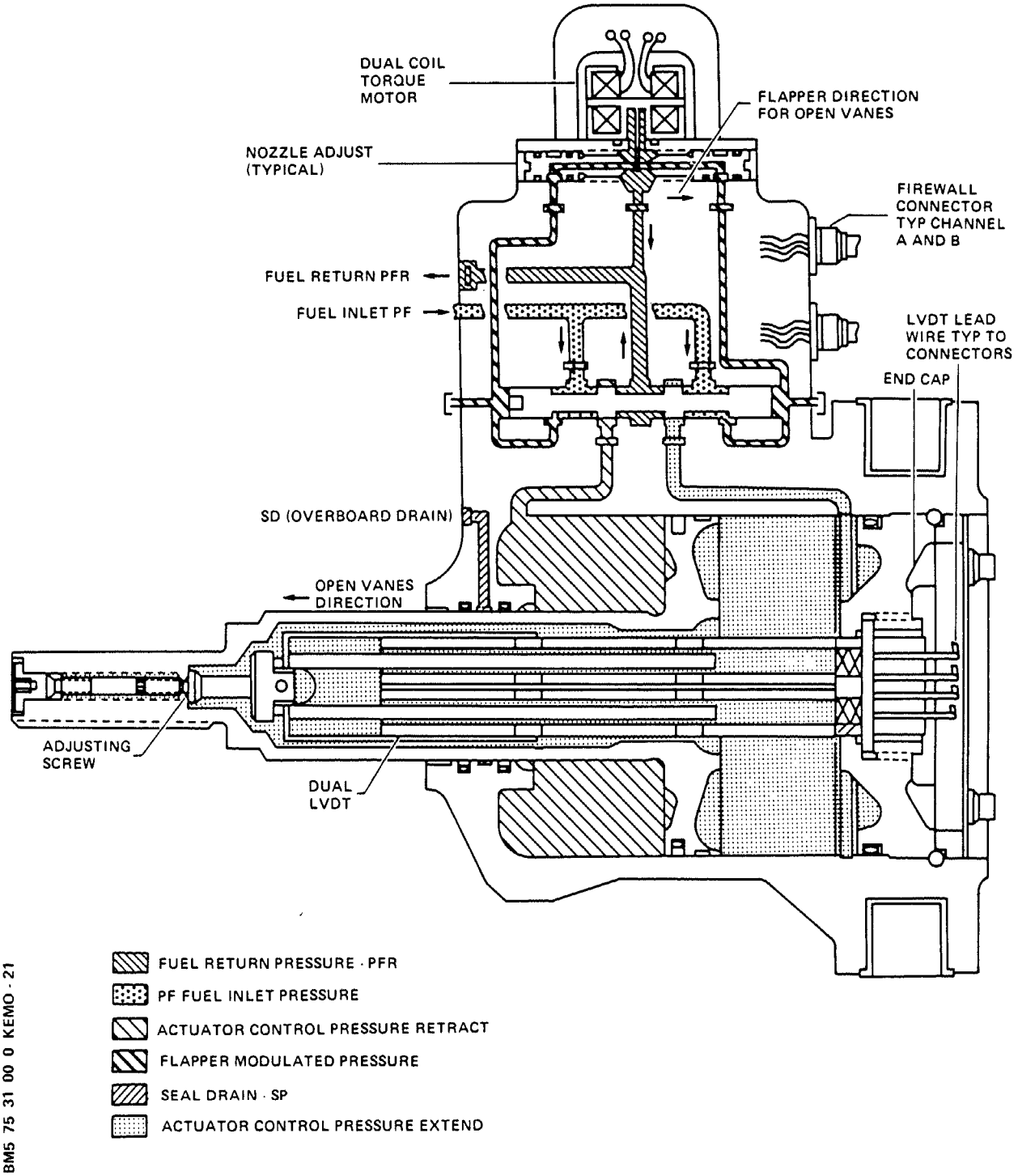
Stator Vane Actuator System
Figure 001



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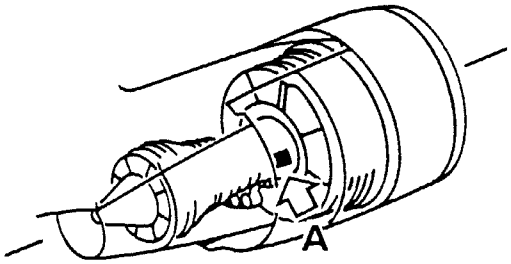
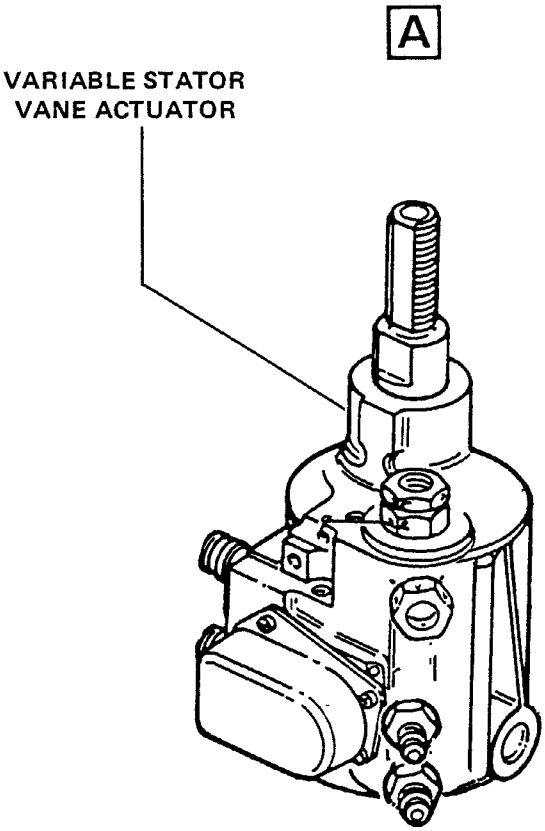
Variable Stator Vane Actuator
Figure 002





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DM5

Variable Stator Vane Actuator - Component Location
Figure 003

VARIABLE STATOR VANE CONTROL SYSTEM - ADJUSTMENT/TEST

1. Rig Variable Stator Vane Actuation System (Manual Procedure)

A. General

WARNING : DO NOT PUT YOUR FINGERS IN THE WAY OF THE LINKAGES UNISON RINGS, OR LEVERS WHEN YOU OPERATE THE STATOR VANE SYSTEM.

CAUTION : IT IS VERY IMPORTANT TO DO THIS RIGGING PROCEDURE WITH PRECISION. BAD RIGGING CAN CAUSE INCREASED HPC BLADE FATIGUE, INTERNAL ENGINE DAMAGE, OR COMPLETE ENGINE FAILURE.
ALWAYS REMOVE ALL RIG PINS BEFORE YOU MOVE THE STATOR VANE SYSTEM.

NOTE : Also see the hydraulic procedure in Paragraph 2.

B. Equipment and Materials

ITEM	DESIGNATION
(1)PWA85393	Rig Pin (3 required)
(2)PWA85394	Rig Pin
(3)PWA85395	Rig Pin (Pre SB PW4 ENG 72-246)
(4)PWA86097	Rig Pin (Post SB PW4 ENG 72-246)
(5)PWA85675	Rig Pin Kit (contains the above rig pins)
(6)Material No.P03-001	Oils (Ref. 70-00-00)
(7)	Cotter Pins
(8)	Key Washers
(9)	Seals
10)	Torque Wrench
11)	Circuit Breakers
12)PWA86197	Rig Pin
13)PWA86344	Holder, Rigging
Referenced Procedures	
- 70-00-00, P. Block 201	Engines
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 75-31-00, P. Block 601	Variable Stator Vane Control System

C. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open the fan cowl doors (Ref. 71-13-00, P. Block 301).

D. Procedure (Ref. Fig. 501, 502)

CAUTION : BE SURE AND USE THE CORRECT BELLCRANK RIG PIN. USE THE LARGER PWA 85395 RIG PIN FOR PRE SB PW4 ENG 72-246 ENGINES. USE THE SMALLER PWA 86097 RIG PIN FOR POST SB PW4 ENG 72-246 ENGINES.
BE SURE THAT THE END OF THE RIG PINS ARE PROPERLY AND FULLY INSTALLED.
BE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF YOU LET THE ACTUATOR ROD RETRACT, THE VARIABLE STATOR VANES WILL OVERTRAVEL WHICH MAY RESULT IN HARMFUL STABILITY AND/OR DURABILITY EFFECTS.

TOO MUCH TORQUE WITH THE WRENCH ON THE BELLCRANK DURING THIS RIGGING CAN BEND THE BELLCRANK BRACKET. THIS CAN RESULT IN BAD RIGGING.

(1)Use a standard crowsfoot and wrench on the flats of the bellcrank (3) adjacent to the 5th stage adjuster. Pull down on the wrench until you feel the actuator internal stop. Push up on the wrench until you are off of the actuator internal stop. Pull down on the wrench again. Hold the bellcrank (3) so that the actuator rod (8) is fully extended against the internal stop (vanes open). Hold the actuator fully extended against the internal stop with 300 - 400 lbf.in. (3.39 - 4.51 m.daN) on the crowsfoot. While you hold the actuator fully extended against the internal stop, install the PWA86344 holder between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN). Do not TORQUE the bolt too much. Tighten the detail jamnut by hand. Install the bellcrank PWA 85395 Rig Pin or the bellcrank PWA 86097 Rig-Pin into the bellcrank arm slot (2) and into both holes of the support (1).

(2)If you can install the bellcrank rig pin, remove the rig pin. Remove the holder (PWA86344). Push up on the wrench and retract the actuator rod. Pull down again to fully extend the actuator rod again. Hold the actuator fully extended against the internal stop with 300 - 400 lbf.in. (3.39 - 4.51 m.daN) on the crowsfoot. While you hold the actuator fully extended against the internal stop install the holder (PWA86344) between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN). Do not TORQUE the bolt too much. Tighten the detail jamnut by hand. Install the bellcrank rig pin again with the actuator rod fully extended. Go to step (5).

(3)If you can not install the bellcrank rig pin, go to step (4) and adjust the actuator rod end bearing (5).

(4)If necessary, adjust the actuator rod end bearing (5) as follows.

(a)Remove the holder (PWA86344) remove and discard the cotter pin (12) from the stator vane actuator rod end bearing retaining bolt (4). Loosen and remove the nut (11), washer (10) and bolt (4) from the stator vane actuator rod end bearing.

(b)Remove the lockwire and seal (9) from the actuator rod and make the tabs of key washer (6) straight. Loosen the jamnut (7) and remove the rod end bearing (5). Remove the key washer (6). Install the new key washer and install the rod end bearing (5), threads lubricated with Material No.P03-001. Tighten until the flat surface below the hex is approximately 9/16 inch (14.288 mm) from the flat surface below the actuator rod threads (Ref. Fig. 501) (Sheet 2). This is the approximate initial adjustment only.

(c)Align and temporarily connect the rod end bearing (5) to the bellcrank (3) with the bolt (4).

NOTE : Make sure the bolt head stays against the surface of the bellcrank. Do not let the bolt move out of the bolthole at all.

CAUTION : BE SURE AND USE THE CORRECT BELLCRANK RIG PIN. USE THE LARGER PWA 85395 RIG PIN FOR PRE SB PW4 ENG 72-246 ENGINES. USE THE SMALLER PWA 86097 RIG PIN FOR POST SB PW4 ENG 72-246 ENGINES. BE SURE THAT THE END OF THE RIG PINS ARE PROPERLY AND FULLY INSTALLED.

BE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF YOU LET THE ACTUATOR ROD RETRACT, THE VARIABLE STATOR VANES WILL OVERTRAVEL WHICH MAY RESULT IN HARMFUL STABILITY AND/OR DURABILITY EFFECTS.
TOO MUCH TORQUE WITH THE WRENCH ON THE BELLCRANK DURING THIS RIGGING CAN BEND THE BELLCRANK BRACKET. THIS CAN RESULT IN BAD RIGGING.

(d) Pull down on the wrench and hold the bellcrank (3) so that the actuator rod (8) is fully extended against the internal stop (vanes open). Hold the actuator fully extended against the internal stop with 300 - 400 lbf.in. (3.39 - 4.51 m.daN) on the crowsfoot. While you hold the actuator fully against the internal stop, install the PWA86344 holder between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN). Do not TORQUE the bolt too much. Tighten the detail jamnut by hand. Install the bellcrank rig pin into the bellcrank arm slots (2) and into both holes of the support (1).

(e) If you can install the bellcrank rig pin, remove the rig pin. Remove the holder (PWA86344). Push up on the wrench and retract the actuator rod. Pull down again to fully extend the actuator rod again. Hold the actuator fully extended against the internal stop with 300 - 400 lbf.in. (3.39 - 4.51 m.daN) on the crowsfoot. While you hold the actuator fully extended against the internal stop, install the holder (PWA86344) between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN). Do not TORQUE the bolt too much. Tighten the detail jamnut by hand. Install the rig pin again with the actuator rod fully extended. Go to step (g).

(f) If you can not install the bellcrank rig pin, remove the holder (PWA86344). Adjust the rod end bearing (5) so that you can install the bellcrank rig pin with the actuator rod (3) fully extended, and the holder (PWA86344) installed. Install the bellcrank rig pin.

NOTE : Remove the bolt (4) and turn the rod end bearing (5) for larger adjustment if necessary. Use the flats and turn the actuator rod (8) for smaller adjustment.
You must remove the holder (PWA86344) when you adjust the rod end bearing. You must then install the holder (PWA86344) to install the rig pin again.

(g) Install the washer (10) and nut (11), threads lubricated with Material No.P03-001, to the bolt (4). TORQUE the nut to a minimum of 15 lbf.in. (0.17 m.daN) plus the torque necessary to turn the nut on the bolt. Continue and torque the nut until the slot in the nut aligns with the hole in the bolt. This TORQUE must not be more than 22 lbf.in. (0.24 m.daN) plus the torque necessary to turn the nut on the bolt. Install the cotter pin (12) to the nut. Bend the cotter pin (Ref. 70-00-00, P. Block 201). Lock the rod end bearing to the actuator rod with the jamnut (7). TORQUE the jamnut (7) to between 460 and 510 lbf.in. (5.20 and 5.76 m.daN). With the rig pin and the holder (PWA86344) removed, push down on the wrench. Hold the actuator fully extended against the internal stop with 300 - 400 lbf.in. (3.39 -

4.51 m.daN) on the crowsfoot. While you hold the actuator fully extended against the internal stop install the holder (PWA86344) between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN). Do not TORQUE the bolt too much. Tighten the detail jamnut by hand. Install the bellcrank rig pin again with the actuator rod fully extended. Lock the jamnut (7) and rod end (5) with the key washer (6). Bend one set of tabs onto the rod end bearing (5) and the other set onto the jamnut (7). Install the lockwire and seal (9) (Ref. 70-00-00, P. Block 201).

(5) With the actuator rod (8) fully extended and the bellcrank rig pin fully installed, install three PWA 85393 Rig Pins into the IGV, 5th, and 6th stage unison ring rig pin holes. Install the PWA85394 Rig Pin or the PWA86197 Rig Pin into the 7th stage unison ring rig pin hole.

(6) If you can put all the rig pins in, then remove all the rig pins from the unison rings and the bellcrank. Remove the holder (PWA86344). The system is properly adjusted.

(7) If you can not put any one of the unison ring rig pins in, remove the unison ring rig pins and bellcrank rig pin. Disconnect the unison ring linkage. Disassemble and reassemble with new key washers (20), then adjust as follows.

(a) While you hold the actuator fully extended against the internal stop, install the holder (PWA86344) between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN). Do not TORQUE the bolt too much. Tighten the detail jamnut by hand. Install the bellcrank Rig Pin (PWA85395) or (PWA 86097). Turn the adjusters (18) so that you can install all the unison ring rig pins.

(b) TORQUE the nuts (15) at each changed rod end to between 15 and 22 lbf.in. (0.17 and 0.24 m.daN) plus the torque necessary to turn the nut on the bolt (13). Install the cotter pins (14) (Ref. 70-00-00, P. Block 201).

(c) Examine the adjusters (18) and rod ends for proper installation. Install a piece of wire into the inspection holes (19) at both ends of each adjuster. If you can not put the wire through, the installation is satisfactory. If you can put the wire through at either end, you must disassemble the linkage and adjust it as necessary so that the wire will not pass through.

(d) With the rod ends properly installed, TORQUE the jamnuts (16) at each rod end to between 115 and 150 lbf.in. (1.30 and 1.69 m.daN).

(e) With the bellcrank rig pin installed, install all the unison ring rig pins. If you can not install any one of the unison ring rig pins do step (7) again. If you can install all the unison ring rig pins, then remove all the rig pins from the unison rings and the bellcrank. Remove the holder (PWA86344). The system is properly adjusted.

(f) Bend one set of key washer (20) tabs onto the adjuster (18) flats and the other set onto the jamnuts (16). Install the lockwire and seals (17) to the rod ends (Ref. 70-00-00, P. Block 201).

CAUTION : BE SURE YOU REMOVE ALL RIG PINS AND TOOLS FROM THE ENGINE OR ENGINE DAMAGE CAN RESULT.

E. Close-Up and Test
(1)Inspect stator vane actuator (SVA) position indication (Ref. 75-31-00, P. Block 601).
(2)Close fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

2. Rig Variable Stator Vane Actuation System - (Hydraulic Procedure)

A. General

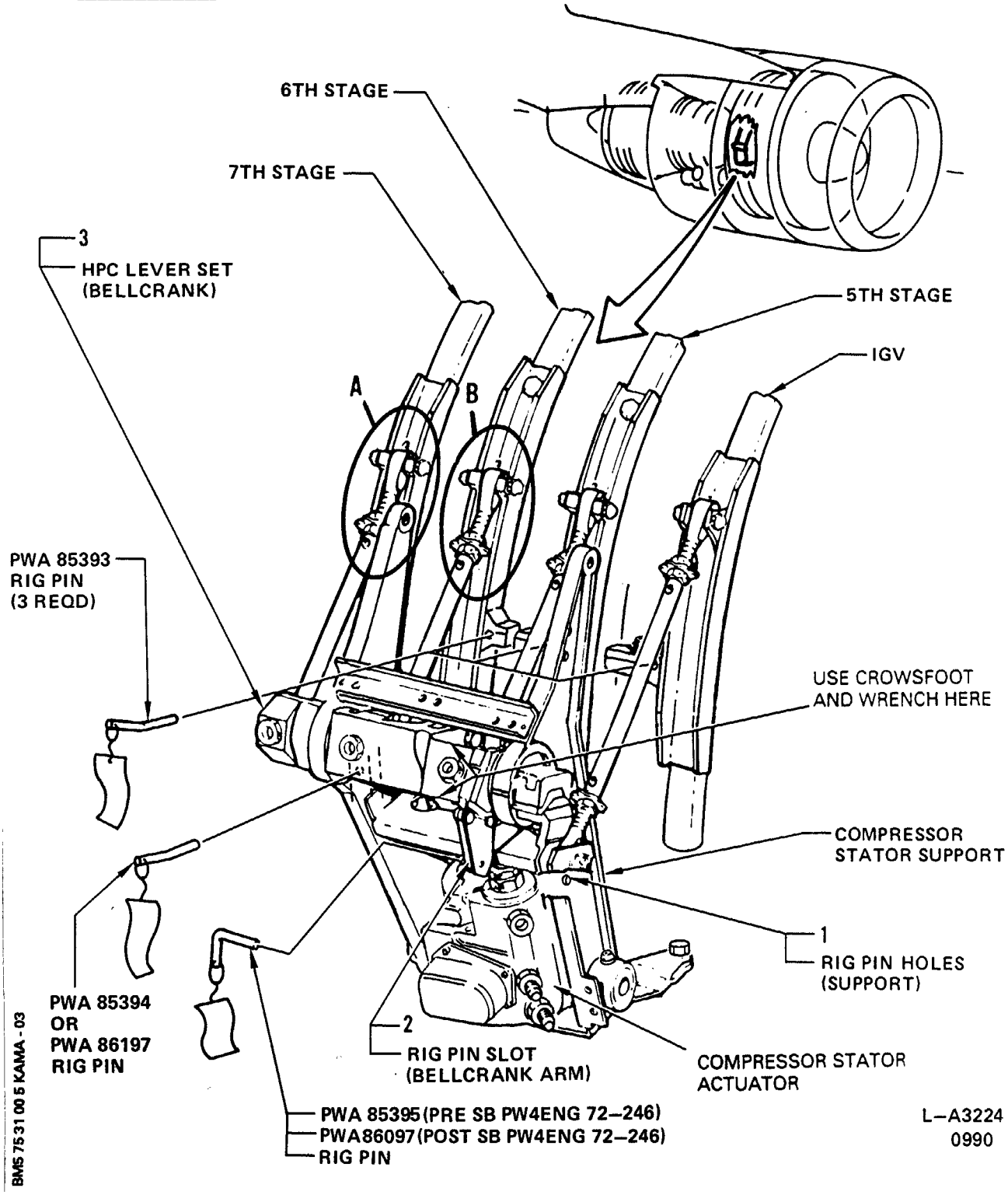
WARNING : DO NOT PUT YOUR FINGERS IN THE WAY OF THE LINKAGES, UNISON RINGS, OR LEVERS WHEN YOU OPERATE THE STATOR VANE SYSTEM.

CAUTION : IT IS VERY IMPORTANT TO DO THIS RIGGING PROCEDURE WITH PRECISION. BAD RIGGING CAN CAUSE INCREASED HPC BLADE FATIGUE, INTERNAL ENGINE DAMAGE, OR COMPLETE ENGINE FAILURE.
ALWAYS REMOVE ALL RIG PINS BEFORE YOU MOVE THE STATOR VANE SYSTEM OR DAMAGE CAN RESULT.

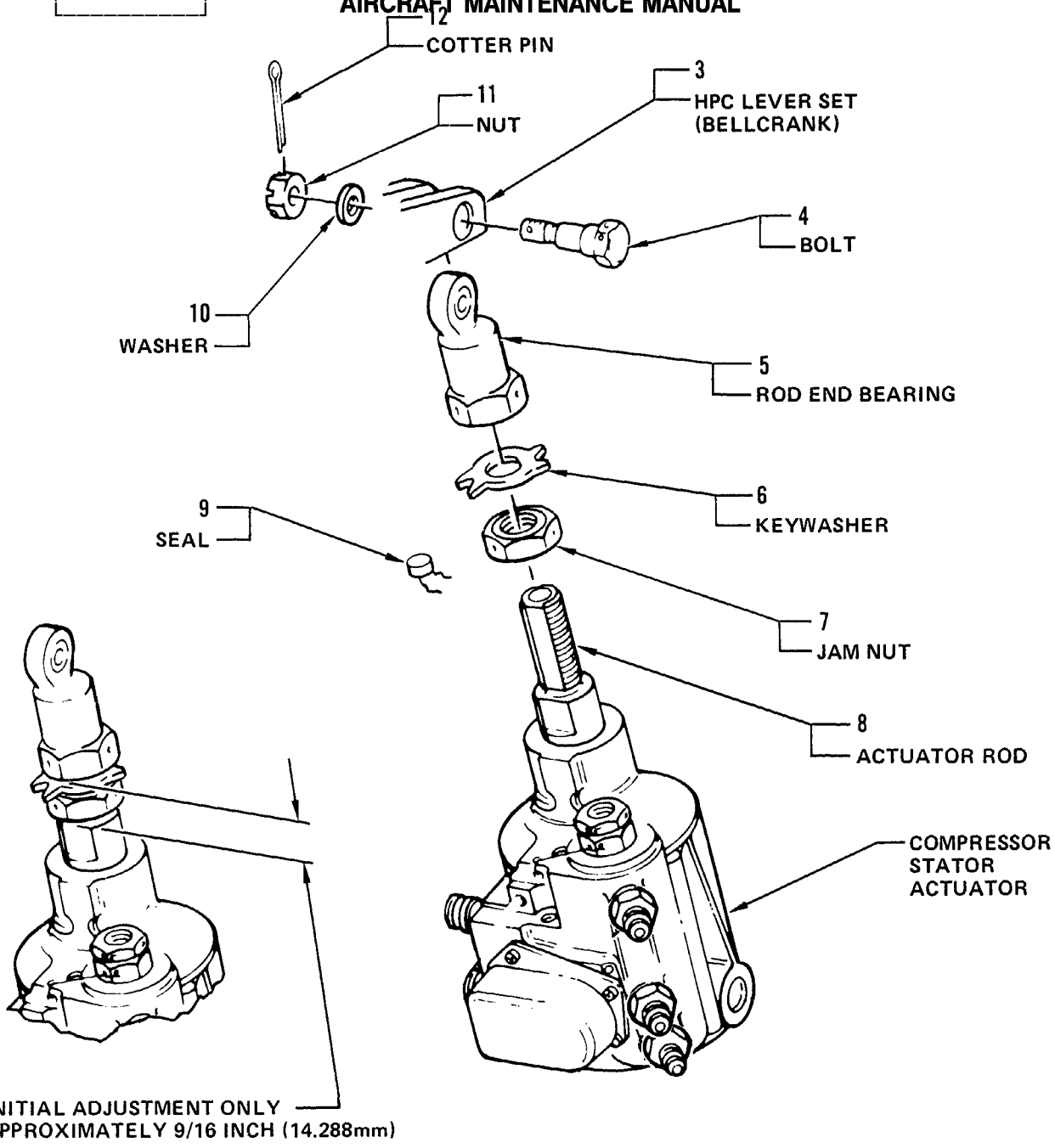
B. Equipment and Materials

ITEM	DESIGNATION
A. PWA85393	Rig Pin (3 required)
B. PWA85394	Rig Pin
C. PWA85395	Rig Pin (Pre SB PW4 ENG 72-246)
D. PWA86097	Rig Pin (Post SB PW4 ENG 72-246)
E. PWA85675	Rig Pin Kit (contains the above rig pins)
F. PWA86317	Electrical Switch Box (Preferred)
G. PWA29451	Adapter
H. PWA86197	Rig Pin
I. PWA49030	Hydraulic Cart (Pneumatic) (Optional to CTE 5100)
J. CTE 5100	Hydraulic Cart (Pneumatic) (Optional to PWA 49030)
K. Material No.P03-001	Oils (Ref. 70-00-00)
L. Material No.P03-003	Oils (Ref. 70-00-00)
R M. Material No.P06-054	Lubricants (Ref. 70-00-00)
N. Cotter Pin	
O. Key Washer	
P. Seal	
Referenced Procedures	
- 70-00-00, P. Block 201	Engines
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 75-31-00, P. Block 601	Variable Stator Vane Control System

C. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan cowl doors (Ref. 71-13-00, P. Block 301).



Stator Vane Control System Rigging Manual
Procedure (Sheet 1/3)
Figure 501



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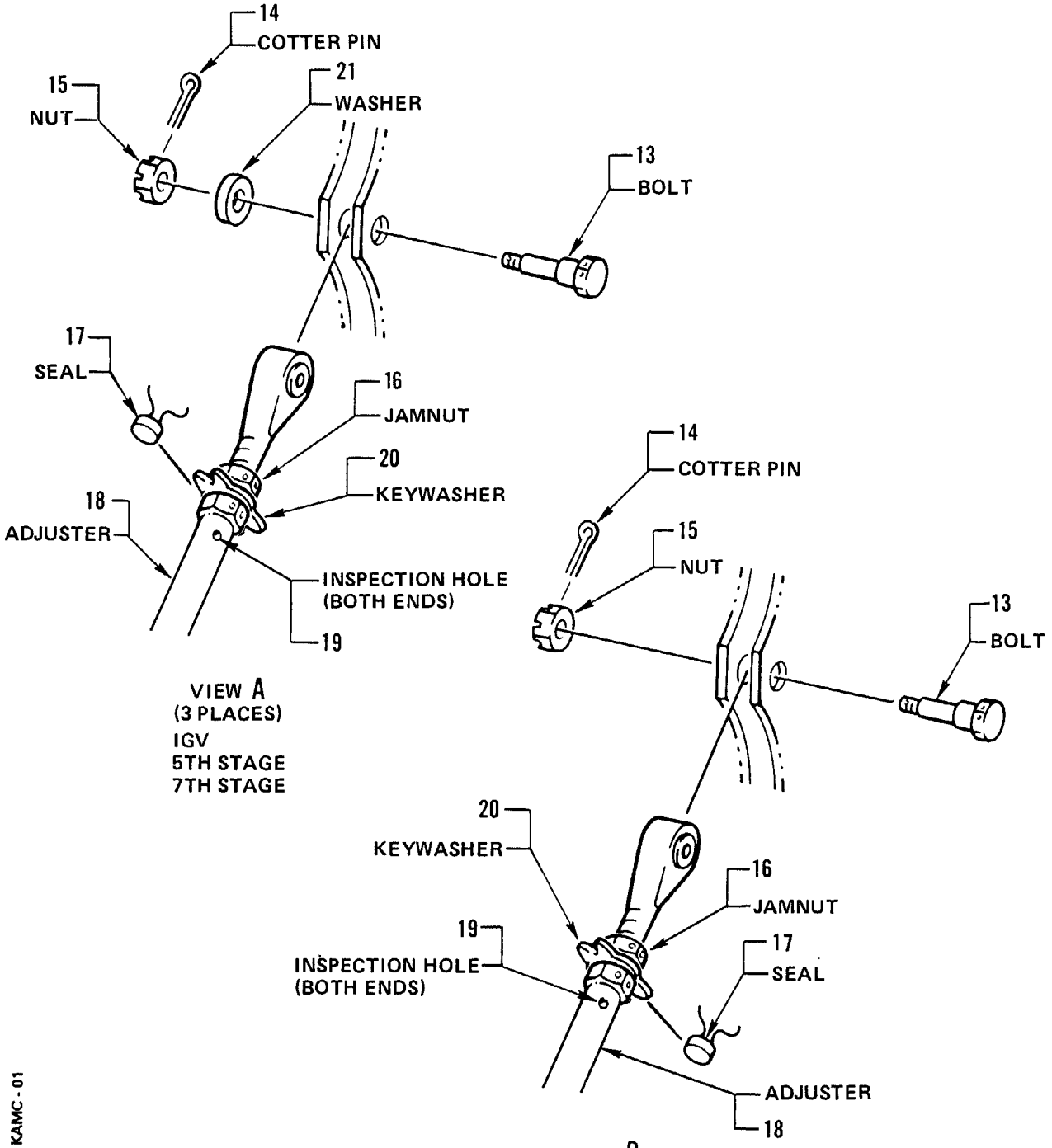
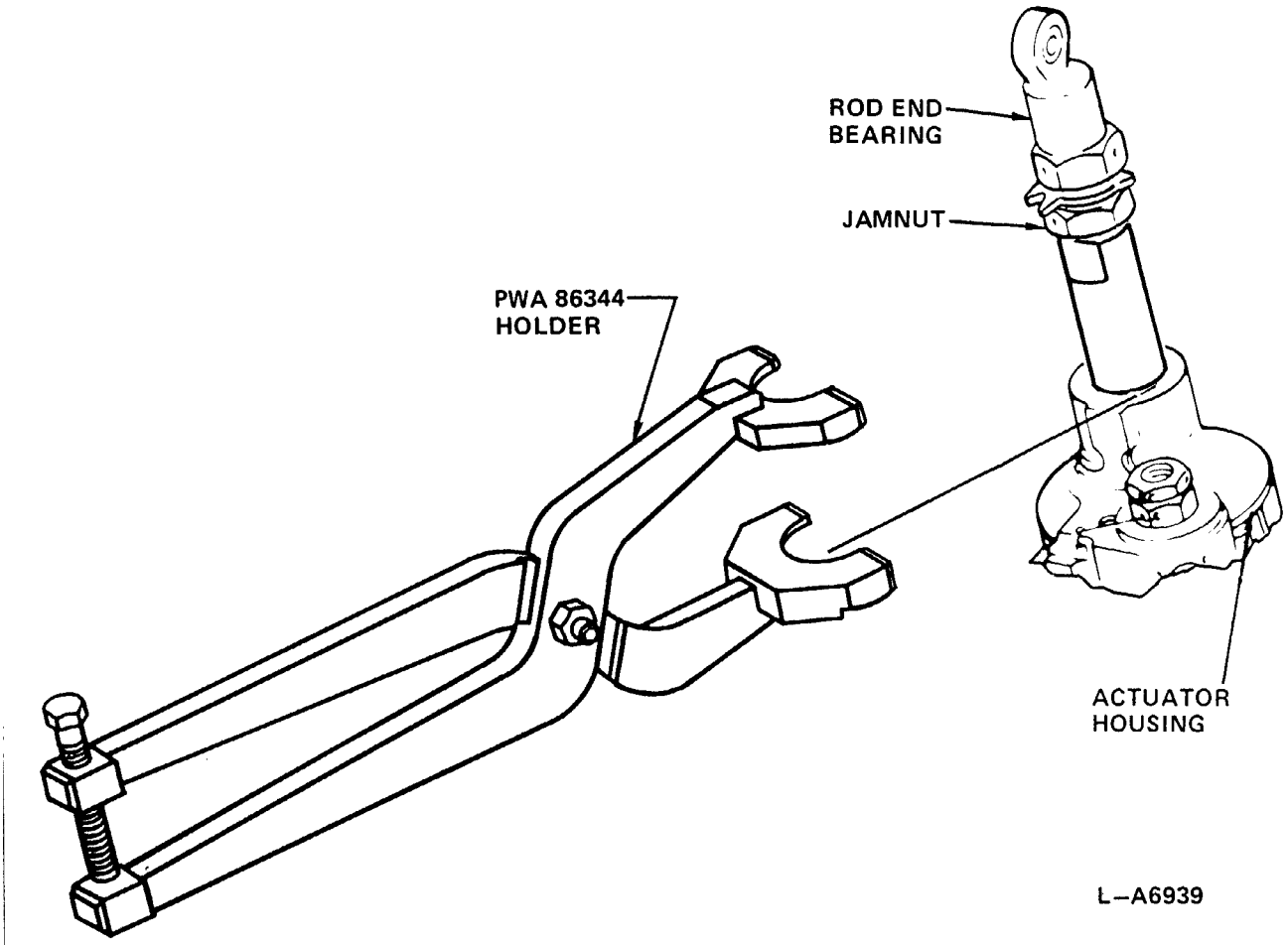
Stator Vane Control System Rigging Manual
Procedure (Sheet 2/3)
Figure 501



Stator Vane Control System Rigging Manual
Procedure (Sheet 3/3)
Figure 501



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PWA86344 Holder Installation
Figure 502

D. Procedure (Ref. Fig. 503, 504)

WARNING : DO NOT LET ENGINE FUEL STAY ON YOUR SKIN FOR A LONG TIME. THE FUEL IS POISONOUS AND CAN GO THROUGH YOUR SKIN. PUT A CONTAINER, MINIMUM CAPACITY OF 5 US GALLONS (19 LITERS), IN POSITION AND COLLECT THE DRAINED FUEL.

(1) Remove the lockwire and disconnect the compressor stator hydraulic pressure tube (CP12) at both ends. Remove the lockwire and disconnect the compressor stator hydraulic return tube (CR03) at both ends. Loosen both clamp bolts and position the tubes away from the actuator adapters. Install the protection covers.

(2) Install the PWA 49030 or CTE 5100 Hydraulic Cart as follows.

(a) Install the PWA 29451 Adapter to the actuator adapter in the "PF" port.

(b) TORQUE the Adapter (PWA 29451) to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN).

NOTE : Hold the actuator adapter while you torque the tool adapter.

(c) Install the hydraulic pressure hose "A" to the Adapter (PWA 29451).

NOTE : If necessary, use a standard 45 degree or 90 degree adapter or elbow on the end of the hose.

(d) Install the hydraulic return hose "B" to the adapter in the "PFR" port.

(e) TORQUE nuts on hoses "A" and "B" to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

NOTE : Hold the adapters while you torque the nuts.

(f) Remove the hose attached to the top of the pump reservoir and examine the level of fluid in the pump reservoir. Fill with Material No.P03-003 to top if necessary.

(3) Install the PWA 86317 Electrical Switch Box as follows.

NOTE : Although the Electrical Switch Box (PWA 86317) is preferred, if the electrical switch box is not available, you can do a check of the vane rigging without the box. Go to step (4).

(a) Disconnect the W4P3 and the W5P7 harness connectors from the stator vane actuator electrical receptacles "J7" and "J3". Install protection covers to the connectors.

(b) Install the electrical lead from the electrical switch box to the upper receptacle on the stator vane actuator marked "J7".

(4) Operate the hydraulic cart and fully extend the actuator rod (vanes open) as follows (Ref. Fig. 503).

(a) Before you connect the air source to the hydraulic cart be sure that you
- put the control handle (1) to the neutral position (center).
- turn the hydraulic valve handle (2) to the closed position (perpendicular to flow).
- turn the air supply valve handle (3) to the closed position (perpendicular to flow).
- turn the smaller adjustment knob (5) clockwise to stop. Do not over tighten.

(b) Connect the air source to the air inlet.

(c) Turn the air supply valve handle (3) to the open position (parallel with flow).

(d) Lift and turn the larger adjustment knob (4) clockwise and raise the air pressure to 25 - 30 psig.

NOTE : The pump ratio is 1 to 10. (30 psig air equals 300 psig

hydraulic).

(e)Turn the hydraulic valve handle (2) to the open position (parallel with flow).

(f)Slowly turn the smaller adjusting knob (5) counterclockwise until the air motor turns.

NOTE : The smaller adjusting knob (5) controls the speed of the actuator and the pressure recovery after actuation. Adjust as necessary.
With the control valve (1) in neutral position, hydraulic pressure will be 0 psig on gage.

(g)Put the control handle (1) on the hydraulic cart to the advance position (towards hoses).

NOTE : Hydraulic pressure to the stator vane actuator "PF" port is 250 - 300 psig.
The actuator piston rod is fully extended at this time (vanes open).

(5)Examine the vane rigging as follows.

NOTE : If an electrical switch box is not available, go to step (6).

(a)Push the power switch (7) on the electrical switch box to on position. Push the actuation switch (6) on the electrical switch box to the retract position (vanes closed) to retract the actuator rod (8).

(b)Push the actuation switch (6) on the electrical switch box to the extend and retract positions several times to operate the actuator. Stop the rod (8) in the extended position. Go to step (7).

(6)If the Electrical Switch Box (PWA 86317) is not available, operate the stator vane system as follows.

(a)Turn the air supply valve handle (3) to the closed position (perpendicular to flow). Hydraulic pressure will bleed off.

(b)Use a standard crowsfoot and wrench on the flats of the bellcrank (4) adjacent to the 5th stage adjuster (Ref. Fig. 504). Push up on the wrench and move the bellcrank (4) to the closed position. Remove the crowsfoot and wrench.

(c)Operate the hydraulic cart and supply 250 - 300 psig hydraulic pressure to the actuator PF port. The stator vane actuator will move to the full open position. The stator vane actuator piston is now extended against the internal stop. Do step (6) again (one more time).

CAUTION : BE SURE AND USE THE CORRECT BELLCRANK RIG PIN. USE THE LARGER PWA 85395 RIG PIN FOR PRE SB PW4 ENG 72-246 ENGINES. USE THE SMALLER PWA 86097 RIG PIN FOR POST SB PW4 ENG 72-246 ENGINES. BE SURE THAT THE END OF THE RIG PINS ARE PROPERLY AND FULLY INSTALLED.

(7)With the actuator rod fully extended, (vanes open) put the bellcrank PWA 85395 Rig Pin or bellcrank PWA 86097 Rig Pin into the rig pin slot of the bellcrank arm (3) and into both holes of the support (2).

(8)If you can put the bellcrank rig pin in, go to step (11) and do a check of the unison rings rigging.

(9)If you can not put the bellcrank rig pin in, go to step (10) and adjust the actuator rod end.

CAUTION : RIG PINS MUST ALWAYS BE REMOVED PRIOR TO RELEASING ACTUATOR PRESSURE OR DAMAGE TO SYSTEM CAN RESULT.

(10)If necessary, adjust the actuator rod end bearing (6) as follows.

(a)Turn the air supply valve handle (3) (Ref. Fig. 503) to the closed position (perpendicular to flow).

(b)Remove and discard the cotter pin (12) (Ref. Fig. 504) from the stator vane actuator rod end bearing retaining bolt (5). Loosen and remove the nut (13), washer (11) and bolt (5) from the stator vane actuator rod end bearing.

(c)Remove the lockwire and seal (10) from the actuator rod and make the tabs of key washer (7) straight. Loosen the jamnut (8) and remove the rod end bearing (6). Remove the key washer (7). Install the new key washer and install the rod end bearing (6), threads lubricated with Material No.P03-001. Tighten until the flat surface below the hex is approximately 9/16 inch (14.288 mm) from the flat surface below the actuator rod threads (Ref. Fig. 504) (Sheet 2/3). This is the approximate initial adjustment only.

(d)Align and temporarily connect the rod end bearing (6) to the bellcrank (4) with the bolt (5).

NOTE : Make sure the bolt head stays against the surface of the bellcrank. Do not let the bolt move out of the bolthole at all.

(e)Operate the hydraulic cart and supply 250 - 300 psig hydraulic pressure to the actuator PF port. Fully extend the actuator rod (9) to the full open position.

CAUTION : BE SURE THE ACTUATOR ROD STAYS FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF THE ACTUATOR ROD IS ALLOWED TO RETRACT, THE VARIABLE STATOR VANES WILL OVERTRAVEL WHICH MAY RESULT IN HARMFUL STABILITY AND/OR DURABILITY EFFECTS.

(f)Adjust the rod end bearing (6) so you can put the bellcrank Rig Pin (PWA 85395) or (PWA 86097) into the rig pin slot of the bellcrank arm (3) and into both holes of the support (2) with the hydraulic pressure on. Install the washer (11) and nut (13), threads lubricated with Material No.P03-011, to the bolt (5). TORQUE the nut to a minimum of 15 lbf.in. (0.17 m.daN) plus the torque necessary to turn the nut on the bolt. Continue to torque the nut until the slot in the nut aligns with the hole in the bolt. This TORQUE must not be more than 22 lbf.in. (0.24 m.daN) plus the torque necessary to turn the nut on the bolt. Install the cotter pin (12) to the nut. Bend the cotter pin (Ref. 70-00-00, P. Block 201).

NOTE : Turn the air supply valve handle (3) to the closed position and temporarily reduce the hydraulic pressure to 0 psig. You can turn the actuator piston rod for the last small adjustment.

(g)Lock the rod end bearing to the actuator rod with the jamnut (8). TORQUE the jamnut (8) to between 460 and 510 lbf.in. (5.20 and 5.76 m.daN).

CAUTION : REMOVE ALL THE RIG PINS FROM THE UNISON RINGS AND THE BELLCRANK BEFORE YOU CONTINUE OR DAMAGE CAN RESULT.

(h)Remove the bellcrank rig pin. Push the actuation switch (6) on the electrical switch box to retract and extend the actuator several times through full travel. Stop with the rod fully extended. Go to step (j).

NOTE : If an electrical switch box is not available continue with step (i).

(i)If the Electrical Switch Box (PWA 86317) is not available, operate the stator vane system as follows.

1 Turn the air supply valve handle (3) (Ref. Fig. 503) to the closed position (perpendicular to flow).

2 Use a crowsfoot and wrench on the flats of the bellcrank (4) (Ref. Fig. 504). Push the wrench up and move the system to the closed position. Remove the wrench.

3 Operate the hydraulic cart and supply 250 - 300 psig hydraulic pressure to the actuator PF port. Fully extend the actuator rod (9) to the full open position. The stator vane actuator piston is now extended against the internal stop. Do step (i) again one more time.

(j) With the actuator rod (9) extended fully (vanes open), install the bellcrank rig pin in the rig pin slot (3) of the bellcrank arm and both holes of the support (2). If you can not install the rig pin, do the rod end adjustment again in step (10). If you can install the rig pin, lock the jamnut (8) and rod end (6) with the key washer (7). Bend one set of tabs onto the rod end bearing (6) and the other set onto the jamnut (8). Install the lockwire and seal (10) (Ref. 70-00-00, P. Block 201).

CAUTION : REMOVE ALL THE RIG PINS FROM THE UNISON RINGS AND THE BELLCRANK BEFORE YOU CONTINUE OR DAMAGE CAN RESULT.

(11) Remove the bellcrank rig pin. Operate the hydraulic cart and supply 250 - 300 psig hydraulic pressure to the actuator PF port. Fully extend the actuator rod (9) to the full open position. Install the bellcrank Rig Pin (PWA 85395) or (PWA 86097). Install three PWA 85393 Rig Pins into the IGV, 5th, and 6th stage unison ring rig pin holes. Install the PWA 85394 Rig Pin or PWA86197 Rig Pin into the 7th stage unison ring rig pin hole.

(12) If you can put all the rig pins in, then remove all the rig pins from the unison rings and the bellcrank. Go to step (14).

(13) If you can not put any one of the unison ring rig pins in, remove the unison ring rig pins and bellcrank rig pins. Move the hydraulic cart control handle (1) (Ref. Fig. 503) to the neutral position. Turn the air supply valve handle (3) to the closed position (perpendicular to flow). Disconnect the unison ring linkage. Disassemble and reassemble with new key washers (21) (Ref. Fig. 504) then adjust as follows.

(a) Install the bellcrank Rig Pin (PWA 85395) or (PWA 86097). Turn the adjusters (19) so that you can install all the unison ring rig pins.

(b) TORQUE the nuts (16) at each changed rod end to between 15 and 22 lbf.in. (0.17 and 0.24 m.daN) plus the torque necessary to turn the nut on the bolt (14). Install the cotter pins (15) (Ref. 70-00-00, P. Block 201).

(c) Examine the adjusters (19) and rod ends for proper installation. Install a piece of wire into the inspection holes (20) at both ends of each adjuster. If you can not put the wire through, the installation is satisfactory. If you can put the wire through at either end, you must disassemble the linkage and adjust it as necessary so that the wire will not pass through.

(d) With the rod ends properly installed, TORQUE the jamnuts (17) at each rod end to between 115 and 150 lbf.in. (1.30 and 1.69 m.daN).

CAUTION : REMOVE ALL THE RIG PINS FROM THE UNISON RINGS AND THE BELLCRANK BEFORE YOU CONTINUE OR DAMAGE CAN RESULT.

(e) With all the rig pins removed, operate the hydraulic cart and supply 250 - 300 psig hydraulic pressure to the actuator PF port. Push the

actuation switch (6) (Ref. Fig. 503) to retract and extend the actuator several times through full travel. Stop with the rod fully extended. Go to step (g).

(f) If an electrical switch box is not used, use a standard crowsfoot and wrench on the flats of the bellcrank adjacent to the 5th stage adjuster. Push up on the wrench and move the bellcrank (4) (Ref. Fig. 504) to the closed position. Remove the crowsfoot and wrench. Operate the hydraulic cart and supply 250 - 300 psig hydraulic pressure to the actuator PF port. Extend the actuator to the full open position. Do this again (one more time).

(g) Install the bellcrank Rig Pin (PWA 85395) or (PWA 86097). Install the four unison ring rig pins. If you can not install any one of the rig pins, do step (13) again. Remove all the rig pins.

(h) Bend one set of key washer (21) tabs onto the adjuster (19) flats and the other set onto the jamnuts (17). Install the lockwire and seals (18) to the rod ends (Ref. 70-00-00, P. Block 201).

(14) With the rigging pins removed, turn the air supply valve handle (3) (Ref. Fig. 503) to the closed position (perpendicular to flow). Move the control handle (1) to the (center) neutral position. Disconnect the air supply. Disconnect the Hoses "A" and "B" from the actuator. Remove the Adapter (PWA 29451) from the "PF" port. Install protection covers to the hose ends.

NOTE : Hold the adapters while you disconnect the hoses and tool adapter.

(15) Push the power switch (7) on the electrical switch box to off. Disconnect the electrical connector from the actuator.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(16) Align the keyway and connect the W4P3 and the W5P7 harness connectors to the stator vane actuator receptacles "J7" and "J3" (Ref. 70-00-00, P. Block 201).

(17) Install the compressor stator cylinder hydraulic pressure tube assembly (CP12).

(a) Remove the protection covers. Lubricate the tube adapter threads at
R each end with Material No.P06-054.

(b) Install the tube nuts to the larger adapter on the actuator and to the hydraulic manifold tee handtight only.

(c) TORQUE the clamp bolt, lubricated with Material No.P03-001 to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(d) TORQUE the tube nuts to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN) and wire lock.

(18) Install the compressor stator cylinder hydraulic return tube assembly (CR03).

(a) Remove the protection covers. Lubricate the tube adapter threads at
R each end with Material No.P06-054.

(b) Install the tube nuts to the smaller adapter on the actuator and to the inlet return manifold tee handtight only.

(c) TORQUE the clamp bolt, lubricated with Material No.P03-001 to between

36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(d)TORQUE the tube nuts to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN) and wire lock.

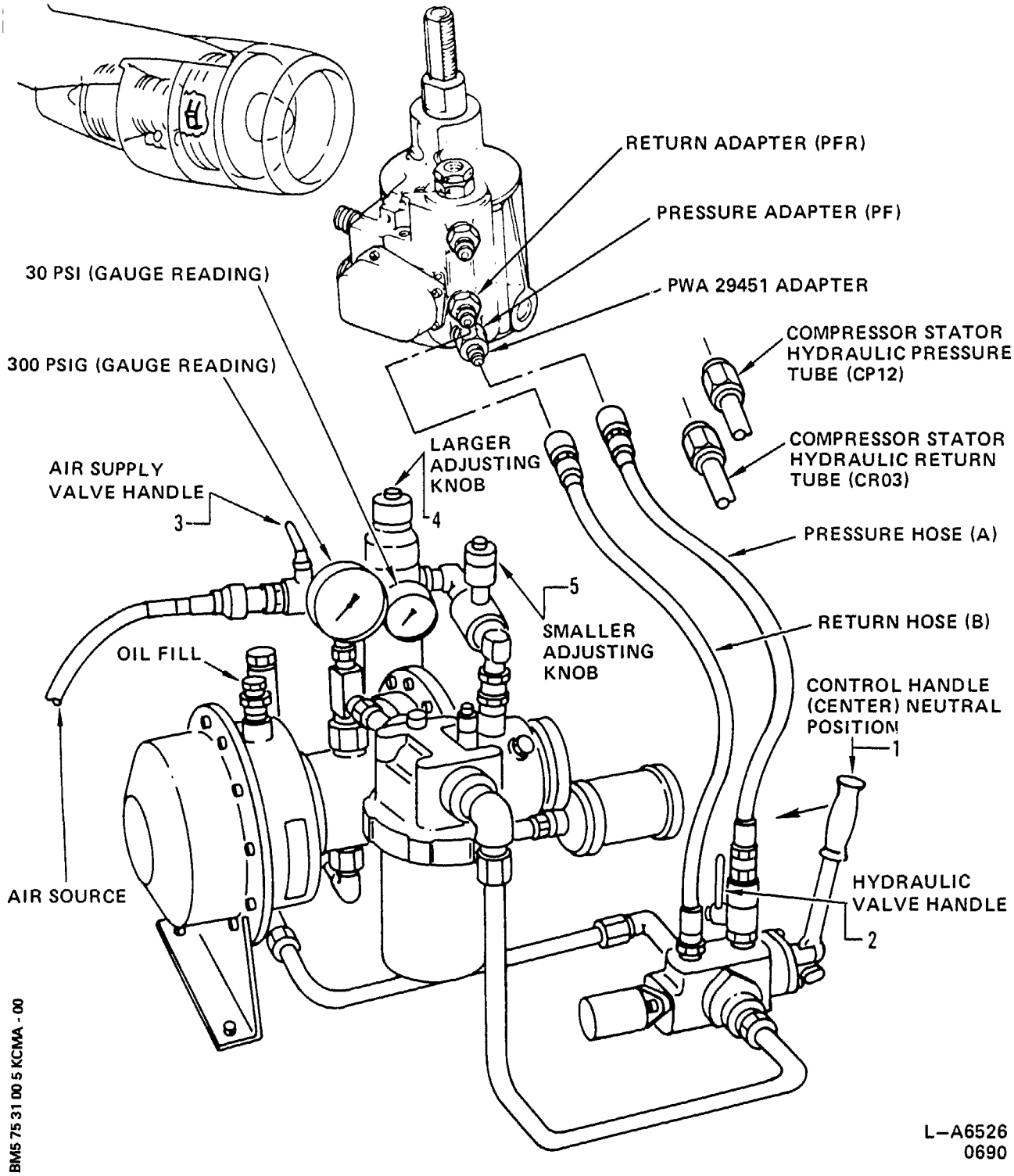
CAUTION : BE SURE YOU REMOVE ALL RIG PINS AND TOOLS FROM THE ENGINE OR ENGINE DAMAGE CAN RESULT.

E. Close-Up and Test

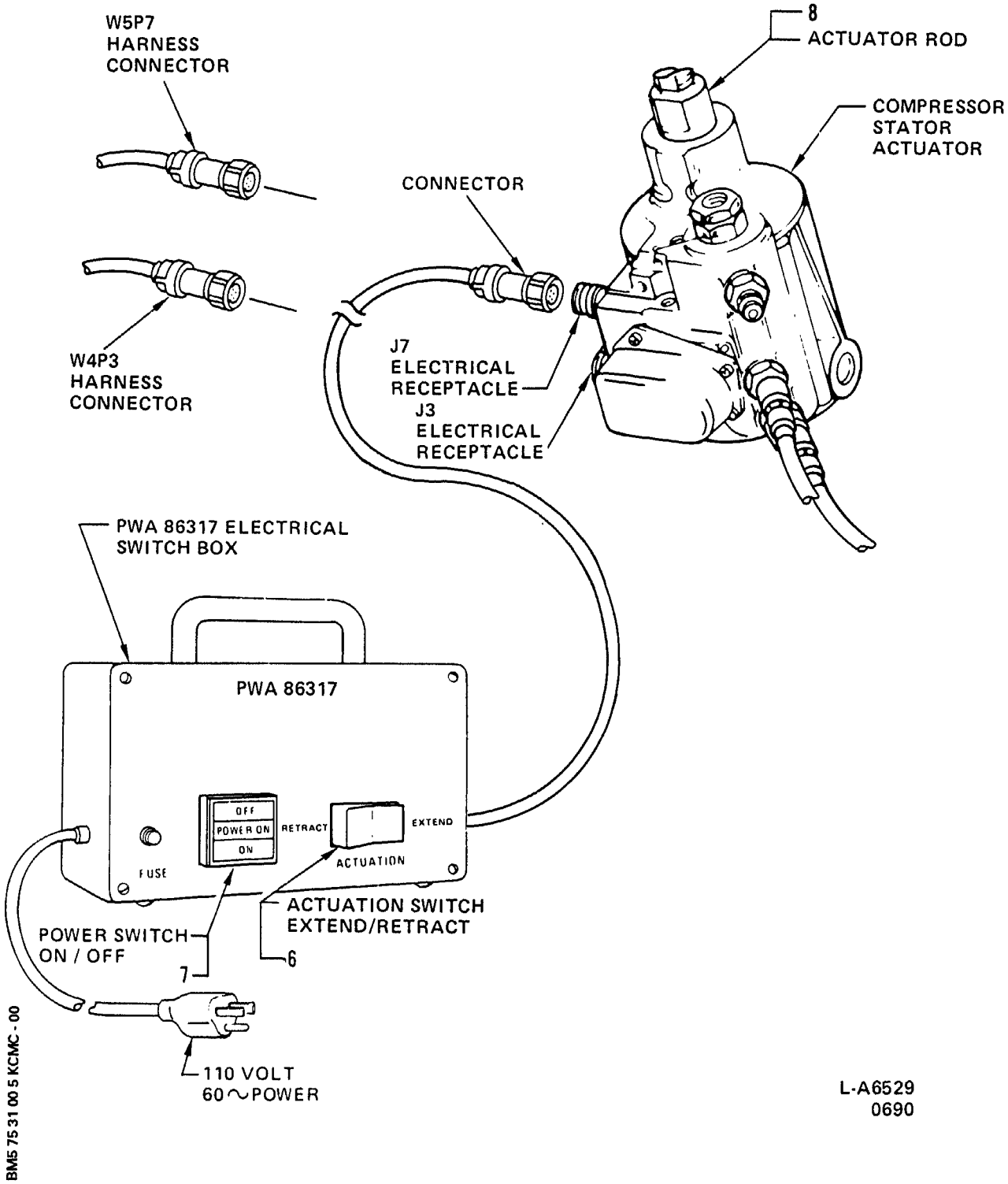
(1)Inspect stator vane actuator (SVA) position indication (Ref. 75-31-00, P. Block 601).

(2)Close fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

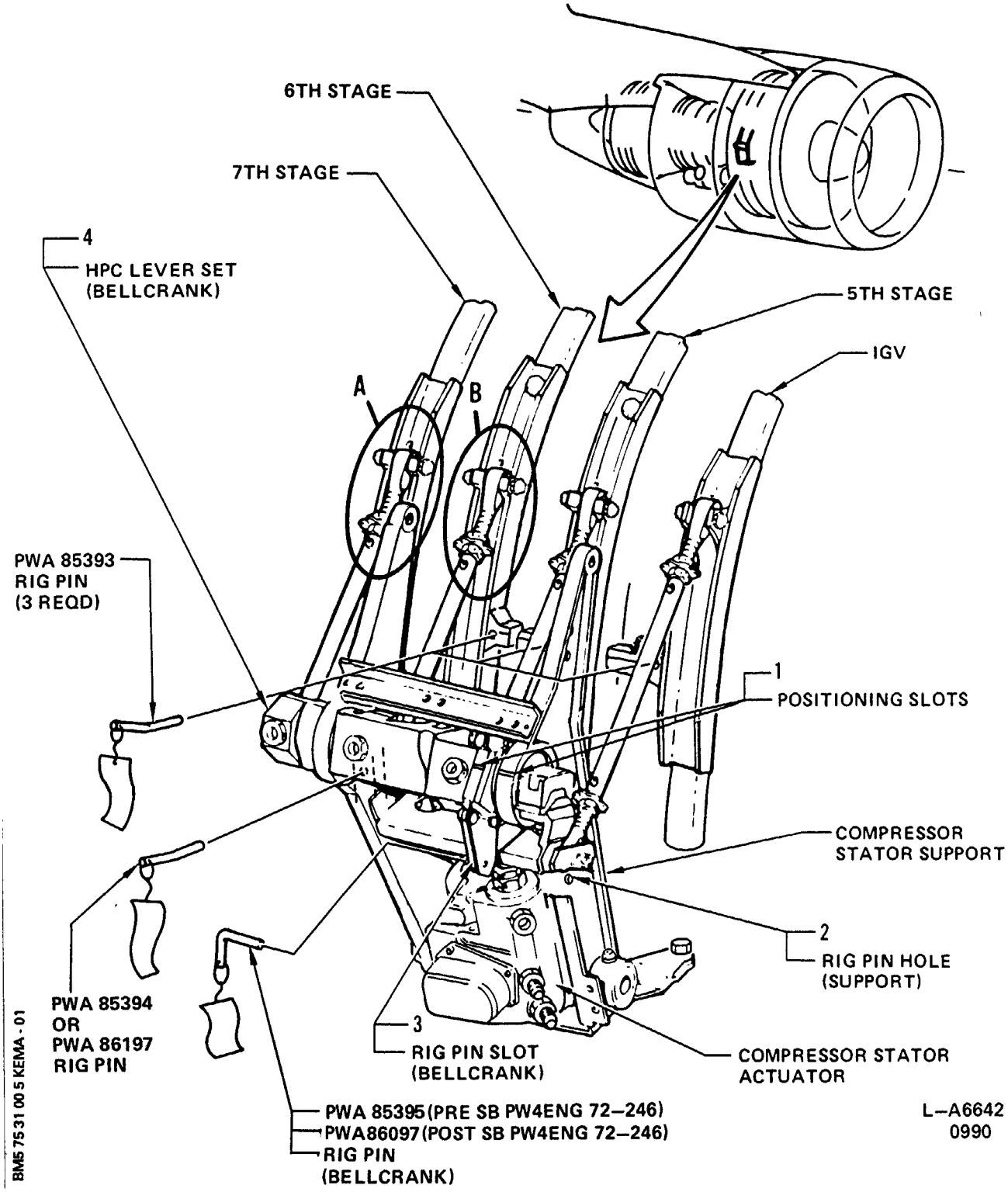
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



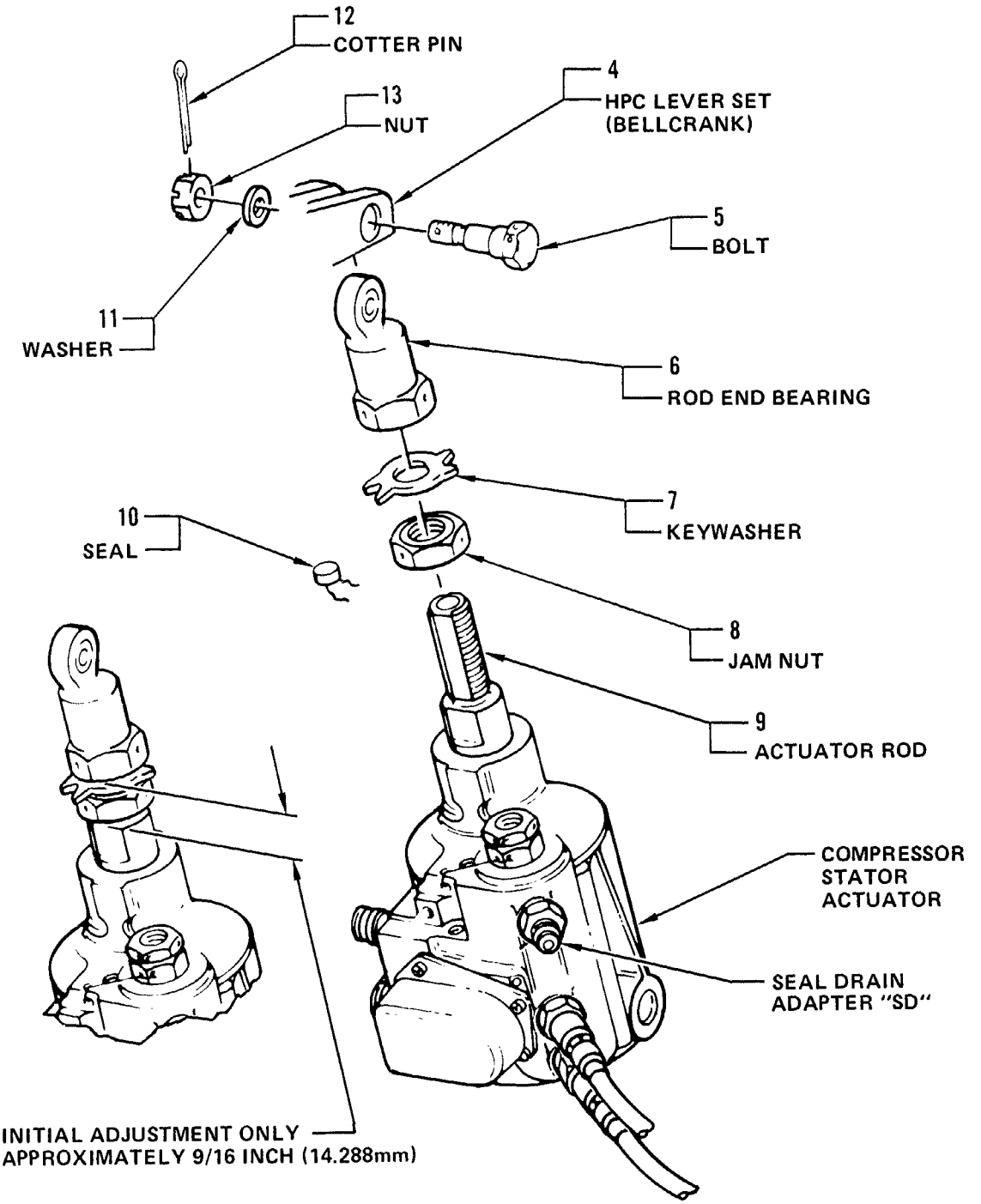
Stator Vane Control System Rigging-Hydraulic Procedure
(PWA 49030 or CTE 5100 Hydraulic Cart Installation) (Sheet 1/2)
Figure 503



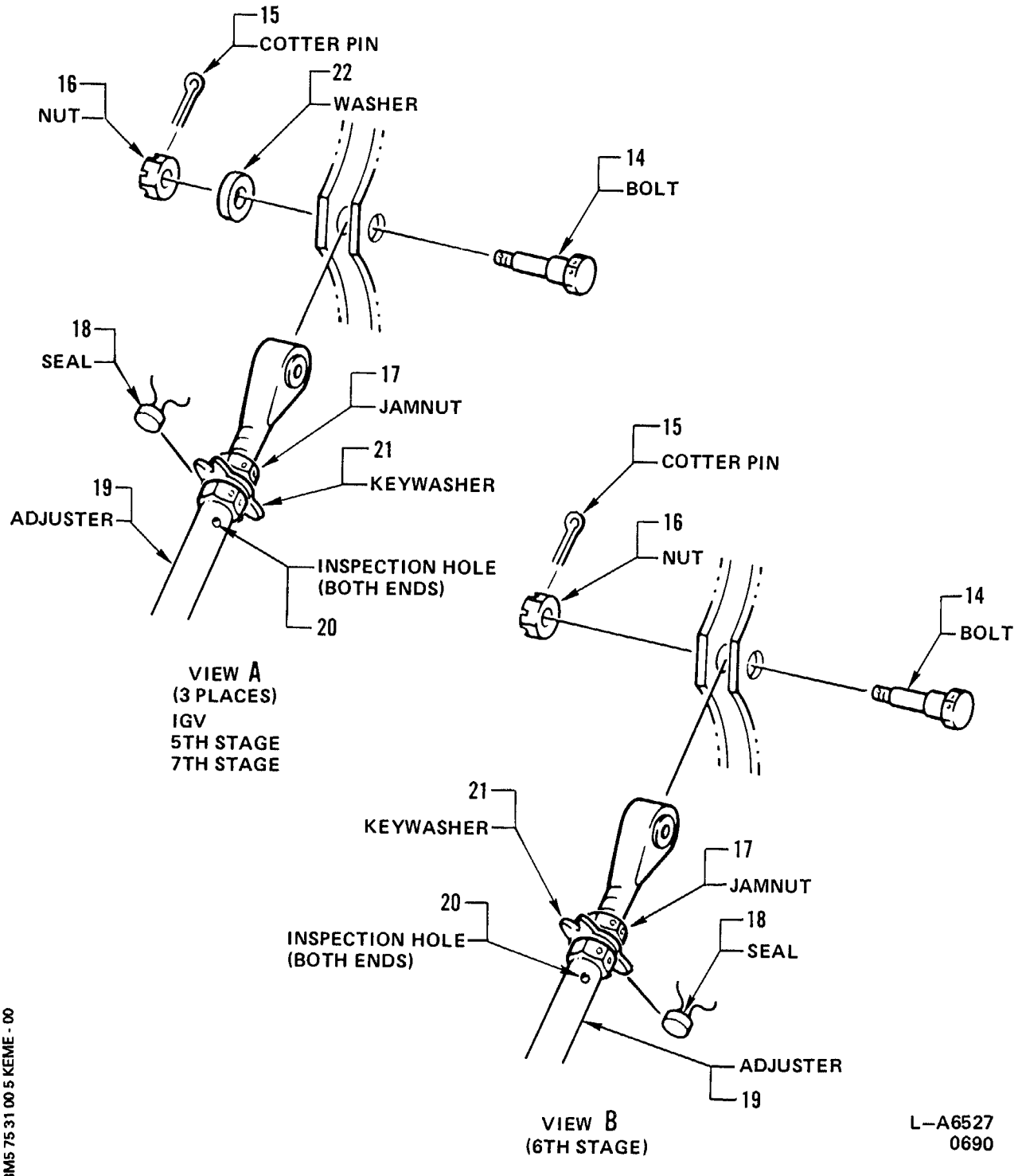
Stator Vane Control System Rigging-Hydraulic Procedure
(PWA 86317 Electrical Switch Box Installation) (Sheet 2/2)
Figure 503



Stator Vane Control System Rigging-Hydraulic Procedure
(Rigging Locations) (Sheet 1/3)
Figure 504



Stator Vane Control System Rigging-Hydraulic Procedure
(Actuator Adjustment) (Sheet 2/3)
Figure 504



Stator Vane Control System Rigging-Hydraulic Procedure
(Unison Ring Linkage Adjustment) (Sheet 3/3)
Figure 504

VARIABLE STATOR VANE CONTROL SYSTEM - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 75-31-03, P. Block 401	Stator Vane Actuator
- 75-31-00, P. Block 501	Variable Stator Vane Control System
- 71-13-00, P. Block 301	Cowl doors
R - 72-00-00, P. Block 601	Engine - General

2. Inspect Variable Stator Vane Actuation System

A. Job Set-Up

(1) Open, safety and tag the appropriate circuit breakers and open the thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Procedure

(1) Inspect variable stator vane actuator for leakage. Any leakage requires replacement of actuator. (Ref. 75-31-03, P. Block 401).

(2) Inspect variable vane actuation linkage for damage or looseness. No wear or end play is permitted in the spherical rod end bearings in the connecting rods between lever sets and VSV synchronizing rings. If damage or looseness is present, the damaged or worn part(s) must be replaced.

(3) Inspect stator vane arms and retaining rivet pins for proper attachment or to locate loose or detached vane arms in stages IGV, 5, 6, and 7. Any loose vane arms require that the synchronizing ring for the stage be replaced. However, any detached vane arms that are found require disassembly of the HPC and inspection of rotor disks, blades and vanes as specified below. Vane arm detachment is defined as a loss of rivet pin attachment to the synchronizing ring, incorrect assembly to the vane trunnion or detachment from the vane trunnion (Ref. 72-00-00, P. Block 601 ; Para 18.).

(4) If any part(s) are replaced per this inspection procedure, rig stator vane actuation system. (Ref. 75-31-00, P. Block 501).

C. Close-Up

(1) Close thrust reverser cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

3. Examine The Compressor Stator Vane Control System Rigging

A. General

WARNING : DO NOT PUT YOUR FINGERS IN THE WAY OF THE LINKAGES, UNISON RINGS, OR LEVERS WHEN YOU OPERATE THE STATOR VANE SYSTEM.

CAUTION : IT IS VERY IMPORTANT TO DO THIS MECHANICAL RIGGING CHECK WITH PRECISION. BAD RIGGING CAN CAUSE INCREASED HPC BLADE FATIGUE, INTERNAL ENGINE DAMAGE, OR COMPLETE ENGINE FAILURE.

ALWAYS REMOVE ALL RIG CHECK PINS BEFORE YOU MOVE THE STATOR VANE SYSTEM.

NOTE : Use this check procedure only :
- for a fast check of the compressor stator vane control system
- with the undersize Rig Check Pins.

Use the rig procedure (Ref. 75-31-00, P. Block 501) :
- if you find unsatisfactory rigging during the check and/or
- if you replace parts of the system.

B. Equipment and Materials

ITEM	DESIGNATION
A. PWA86331	Rig Check Pin (3 required)
B. PWA86332	Rig Check Pin
C. PWA86333	Rig Check Pin (Pre SB PW4ENG72-246)
D. PWA86334	Rig Check Pin (Post SB PW4ENG72-246)
E. PWA86335	Rig Check Pin Kit (Contains the above undersize rig pins)
F. PWA86344	Holder, Rigging
Referenced Procedure	
- 75-31-00, P. Block 501	Variable Stator Vane Control System

C. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open the thrust reverser cowl doors. (Ref. 71-13-00, P. Block 301).

D. Procedure (Ref. Fig. 601, 602)

CAUTION : USE PWA RIGGING CHECK PIN KIT FOR ONLY A CHECK OF THE SYSTEM. DO NOT RIG THE SYSTEM WITH THESE PINS.
THE RIG CHECK PINS USED IN THIS CHECK PROCEDURE HAVE A SMALLER DIAMETER THAN THE RIG PINS USED IN THE RIGGING ADJUSTMENT. THIS WILL PERMIT A SATISFACTORY CHECK ON SYSTEMS WITH SOME WEAR FROM ENGINE OPERATION.

CAUTION : BE SURE AND USE THE CORRECT BELLCRANK RIG CHECK PIN. USE THE LARGER PWA 86333 RIG CHECK PIN FOR PRE SB PW4ENG 72-246 ENGINES. USE THE SMALLER PWA 86334 RIG CHECK PIN FOR POST SB PW4ENG 72-246 ENGINES.
BE SURE THAT THE END OF THE RIG PINS ARE PROPERLY AND FULLY INSTALLED.
BE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG CHECK PIN. IF YOU LET THE ACTUATOR ROD RETRACT, THIS CHECK WILL NOT BE ACCURATE. THIS CAN RESULT IN HARMFUL STABILITY AND/OR DURABILITY EFFECTS.
TOO MUCH TORQUE WITH THE WRENCH ON THE BELLCRANK DURING THIS CHECK CAN BEND THE BELLCRANK BRACKET. THIS CAN RESULT IN BAD RIGGING.

(1)Use a standard crowsfoot and wrench on the flats of the bellcrank adjacent to the 5th stage adjuster.
Pull down on the wrench and hold the bellcrank (3) so that the actuator rod is fully extended against the internal stop (vanes open). Hold the

actuator fully extended against the internal stop with 300 - 400 lbf.in. (3.39 - 4.51 m.daN) on the crowsfoot. While you hold the actuator fully extended against the internal stop, install the PWA 86344 holder between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN). Do not TORQUE the bolt too much. Tighten the detail jamnut by hand. Install the bellcrank PWA 86333 Rig Check Pin or the bellcrank PWA 86334 Rig Check Pin into the bellcrank arm slot (2) and into both holes of the support (1).

(2) If you can install the bellcrank rig check pin, remove the rig check pin. Remove the holder (PWA 86344).
Push up on the wrench and retract the actuator rod. Pull down again to fully extend the actuator rod again. Hold the actuator fully extended against the internal stop with 300 - 400 lbf.in. (3.39 - 4.51 m.daN) on the crowsfoot. While you hold the actuator fully extended against the internal stop, install the holder (PWA 86344) between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN).
Do not TORQUE the bolt too much. Tighten the detail jamnut by hand. Install the bellcrank rig check pin again with the actuator rod fully extended. Go to step (4).

(3) If you can not install the bellcrank rig check pin, adjust the entire variable stator vane control system. (Ref. 75-31-00, P. Block 501).

(4) With the actuator rod fully extended and the bellcrank rig check pin fully installed, install three PWA 86331 Rig Check Pins into the IGV, 5th, and 6th stage unison ring rig pin holes. Install the PWA 86332 Rig Check Pin into the 7th stage unison ring rig pin hole.

(5) If you can put all the rig check pins in, then remove all the check rig pins from the unison rings and the bellcrank. Remove the holder (PWA 86344). The system is properly adjusted.

(6) If you can not put any one of the unison ring rig check pins in, adjust the entire compressor stator vane control system per Adjustment/Test-01.
CAUTION : BE SURE YOU REMOVE ALL OF THE RIG CHECK PINS AND THE HOLDER AFTER THE CHECK. DAMAGE TO THE COMPRESSOR STATOR VANE CONTROL SYSTEM CAN RESULT.

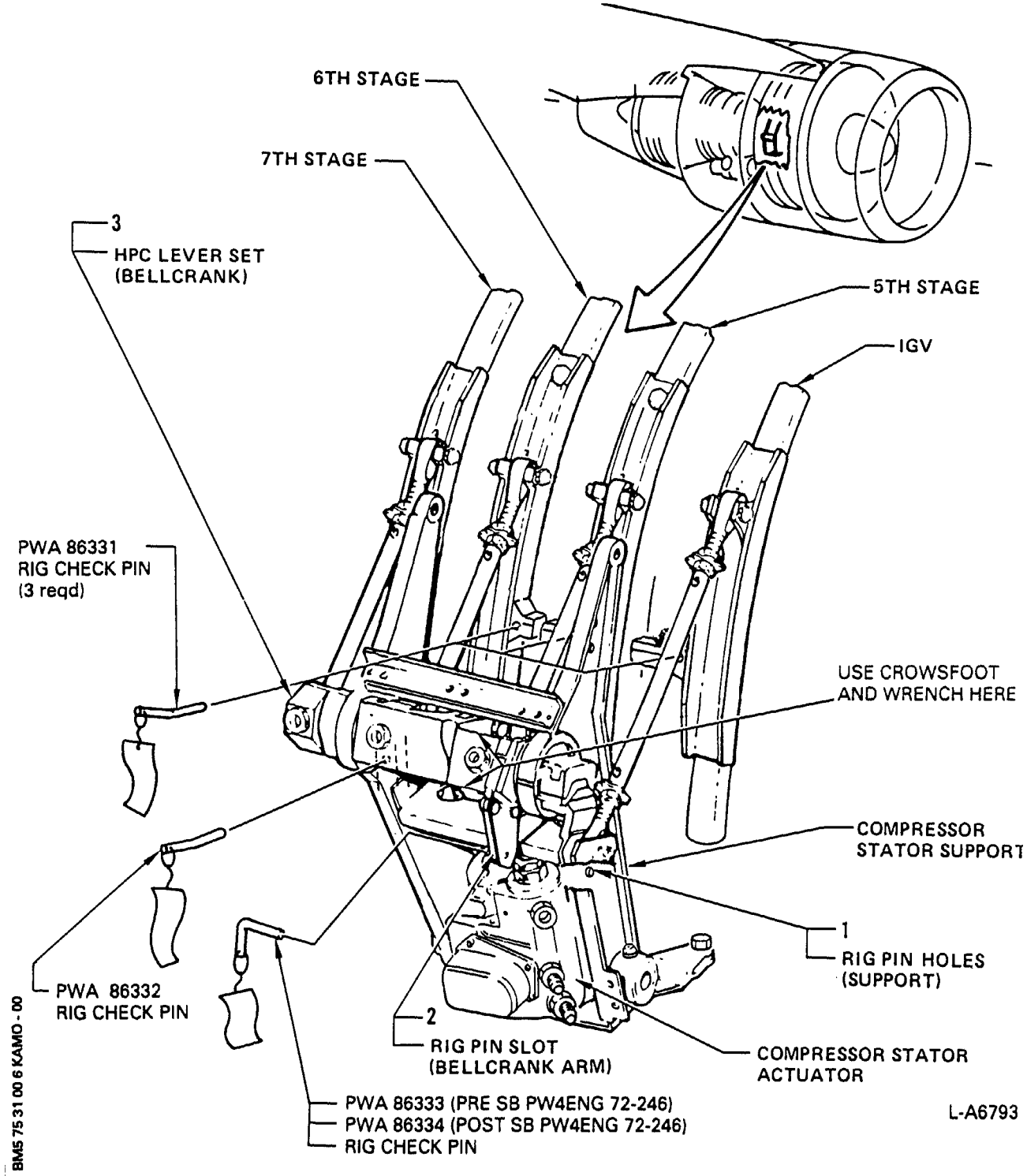
E. Close-Up

(1) Close thrust reverser cowl door, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

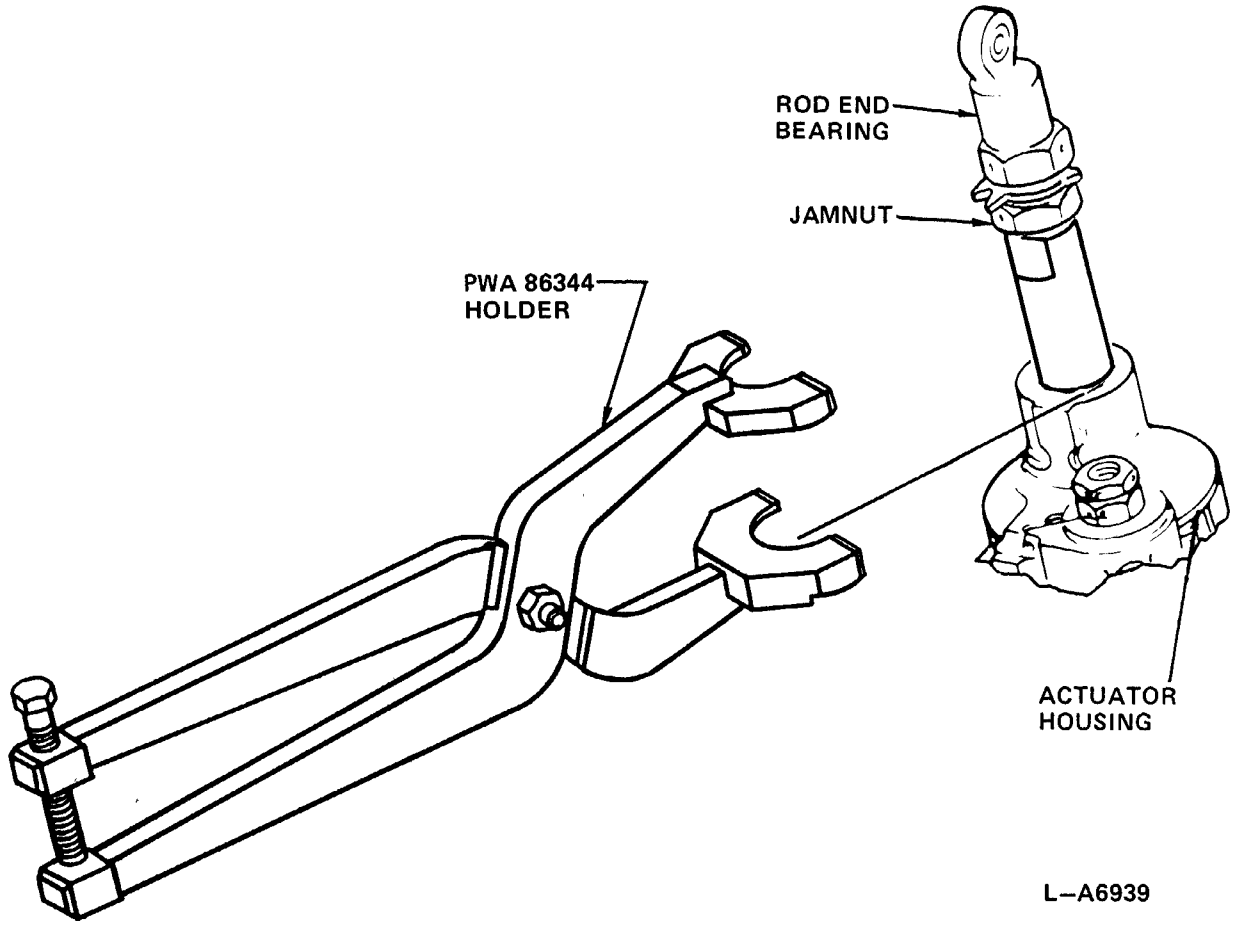
4. Inspect Stator Vane Actuator (SVA) Position Indication

A. Equipment and Materials

ITEM	DESIGNATION
A. PWA86333	Rig Check Pin (Pre SB PW4ENG 72-246)
B. PWA86334	Rig Check Pin (Post SB PW4ENG 72-246)
Reference Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-31-00, P. Block 501	Variable Stator Vane Control System
- 75-31-03, P. Block 401	Stator Vane Actuator



Stator Vane Control System
Rigging Check (Rigging Locations)
Figure 601



BM5 75 31 00 6 KCMO - 00

PWA 86344 Holder Installation
Figure 602

NOTE : PWA86335 rigging check pin kit contains the above undersize rig pins to only check the system. These pins have a smaller diameter than the rig pins used in the rigging procedure (Ref. 75-31-00, P. Block 501). You can use the rig pins listed in the rigging procedure if the rig check pins (listed above) are not available. If you use the rig pins listed in the rigging procedure, they might not fully engage because of some wear from engine operation.

B. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure
(1)Move the lever set (bellcrank) to the vane open position (unison rings move up) with a standard wrench on the wrench flats. Insert the rig pin.
(2)With FADEC ground test power ON, read the SVA position (percent) on the flight compartment display. Both FADEC channels must show 93.6 to 95.6 percent for SVA position.
(3)Remove the bellcrank rig pin. Move the bellcrank to the vanes full closed stop (unison rings move down).
(4)With FADEC ground test power ON, read the SVA position (percent) on the flight compartment display. Both FADEC channels must show -6.4 to -4.4 percent.
(5)If either position gives a faulty reading, or if the system is hard to operate :
(a)Perform FIM visual check. Stator vane unison ring/actuator linkage check and perform FIM engine check - Variable stator vane system check.
(b)Rig stator vane system (Ref. 75-31-00, P. Block 501).
(c)Replace SVA (Ref. 75-31-03, P. Block 401).

D. Close-Up
(1)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

5. Inspect HPC Synchronizing Ring Runners
(Ref. Fig. 603)

A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-31-00, P. Block 501	Variable Stator Vane Control System

B. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure
(1)The engine may continue in service for the specified continued service

cycles if any one of these inspection results are met :
(a)Maximum 1 runner missing or loose per stage. Replace at next scheduled aircraft maintenance.
(b)Maximum 3 runners missing or loose per engine with no more than 1 missing or loose per stage. Replace at next scheduled aircraft maintenance.
(c)Maximum 3 missing or loose runners per engine with not more than 3 missing or loose runners per stage and no more than 2 adjacent missing or loose runners per stage. Replace within 50 flight cycles.
(d)More than 3 missing or loose runners per stage or more than 2 adjacent missing or loose runners per stage. Replace runners immediately.

D. Close-Up
(1)If any part(s) are replaced per this inspection procedure, rig stator vane control system (Ref. 75-31-00, P. Block 501).
(2)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

R 6. Inspect the 5th Stage HPC Synchronizing Ring Vane Arm Rivet Pin Tack Welds
R (Ref. Fig. 604)

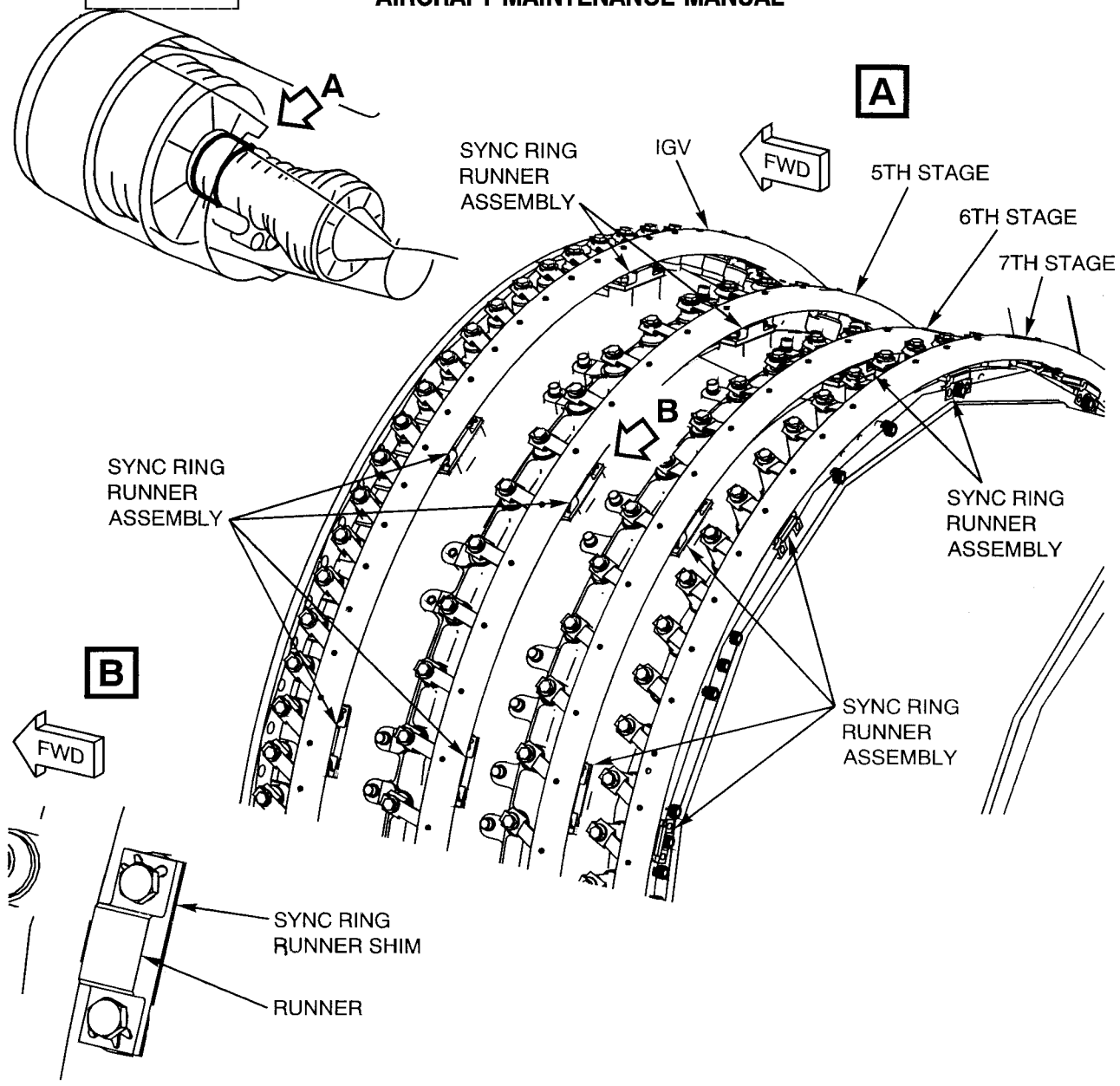
R A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-32-03, P. Block 801	5th Stage Synchronizing Ring Assembly

R B. Job Set-Up
R (1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

R C. Procedure
R (1)A maximum of 3 vane arm pin locations can be cracked.
R (2)At locations with broken tack welds, examine the amount of looseness between the rivet pin and the synchronizing ring. You can examine the looseness visually or by moving the rivet pin.
R (3)Tack welds that are 0.010 in. (0.254 mm) maximum loose can be repaired (Ref. 72-32-03, P. Block 801).

R D. Close-Up
R (1)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



SYNCHRONIZING RING RUNNER
TYPICAL
(WITH SYNCHRONIZING
RING REMOVED
FOR CLARITY)

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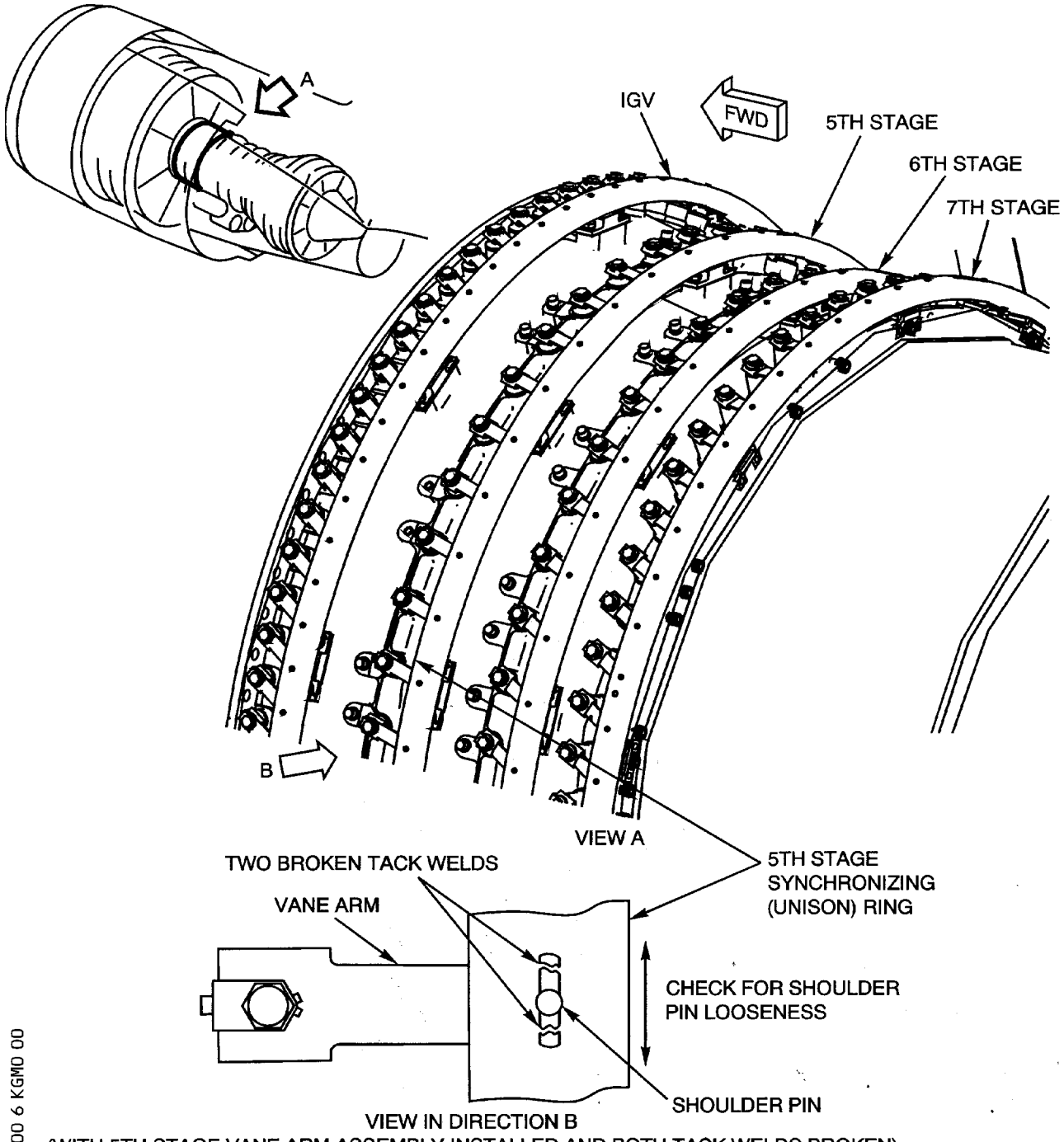
L-D1403 (0803)
PW V

Synchronizing Ring Runner Typical Locations
Figure 603



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5th Stage Synchronizing Ring Rivet Pin Inspection
Figure 604

R

STATOR VANE ACTUATOR - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Closures
C.	Protective Covers
D.	Container Minimum Capacity of 5 US Gallons (19 Liters)
E. PWA85688	Puller, Jackscreew
F.	Torque Wrench
G.	Cotter Pins
H.	Key Washer
I.	Packings
J. Material No.P03-001	Oils (Ref. 70-00-00)
K. Material No.P05-289	Special Materials (Ref. 70-00-00)
L. Material No.P05-291	Special Materials (Ref. 70-00-00)
M. Material No.P05-292	Special Materials (Ref. 70-00-00)
N. Material No.P06-002	Lubricants (Ref. 70-00-00)
R P. Material No.P06-054	Lubricants (Ref. 70-00-00)
Q. Material No.P06-005	Lubricants (Ref. 70-00-00)
R. Material No.P06-037	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-13-00, P. Block 301	Cowl Doors
- 75-31-03, P. Block 501	Stator Vane Actuator

2. Procedure

A. Job Set-Up

(1)On the FIRE control module (overhead panel) of the engine concerned pull the fire handle and install a warning notice to prohibit actuation in normal position (pushed) while maintenance is in progress.

(2)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
Engine 1			
133VU	ENGINES-ENG1 FADEC SOLENOIDS CHA. A	19KS	332/U70
133VU	ENGINES-ENG1 FADEC SOLENOIDS CHA. B	21KS	331/V70
Engine 2			
133VU	ENGINES-ENG2 FADEC SOLENOIDS CHA. A	18KS	332/U71
133VU	ENGINES-ENG2 FADEC SOLENOIDS CHA. B	20KS	331/V69

(3)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)

(1)Disconnect electrical connector from IDG air/oil heat exchanger wire harness. Remove clamp securing harness to drain tube.
(2)Remove clamp securing drain tube to bracket. Remove drain tube from union in stator vane actuator and from upper arm of cross tee.
(3)Disconnect W4P3 and W5P7 harness connectors (10) from stator vane actuator (18). Install protective covers.
(4)Disconnect ground cable (11) attached to actuator (18).
(5)Remove lockwire or safety cable and disconnect tube nuts securing hydraulic pressure tube (8) and return tube (9) to actuator (18).
NOTE : Be prepared to catch fuel in container with a minimum capacity of 5 US gallons (19 liters).
(6)Remove cotter pin (1), nut (2), bolt (3), washer (25) (Post SB PW4ENG 72-498) and stop (7) from both sides of support bracket (5). Discard cotter pins.
(7)Use the PWA 85688 Jackscrew Puller and remove the bearing pins (4) from both sides of the support bracket (5) as follows. For each side :
(a)Install the puller jackscrew into the bearing pin (4). Tighten the jackscrew by hand.
(b)Install the puller sleeve over the jackscrew.
(c)Install the puller into the sleeve and to the jackscrew. Tighten the puller by hand.
(d)While you hold the jackscrew with an allen wrench, turn the puller with a spanner wrench or a 0.180 in. diameter punch. Turn the puller until you remove the bearing pin (4).
(8)Remove cotter pin (21), nut (20), washer (22) and shoulder bolt (23) securing actuator rod end bearing (24) to bellcrank. Discard cotter pin. Remove actuator from engine and install protective closures.
(9)If actuator (18) is to be replaced, comply with the following :
(a)Remove adapters (12) and (15) from actuator and discard packings (13) and (14). Install protective closures.
(10)Cut lockwire and remove seal (16), rod end bearing (24), key washer (19) and nut (17) from actuator rod. Discard lockwire, key washer and seal.

C. Installation (Ref. Fig. 401)
(1)If new actuator (18) is being installed comply with the following :
(a)Install new packings (13) and (17), lubricated with Material No.P06-002, on adapters (12) and (15).
Remove protective closures from actuator ports and install adapters, threads lubricated with Material No.P03-001. TORQUE smaller adapter at return port to between 110 and 120 lbf. in. (1.24 and 1.36 m.daN). TORQUE larger adapter at pressure port to between 150 and 170 lbf.in. (1.69 and 1.92 m.daN).
(b)Install nut (17), new key washer (19) and rod end bearing (24) to actuator. Do not tighten nut or bend key washer.
(2)Position actuator (18) to support bracket (5) with rod end bearing (24) through hole in support bracket. Install bearings in support bracket and align side mount holes in actuator with openings in support bracket bearings. Apply Material No.P06-005 or Material No.P06-037 to the bearing pins (4) and insert pins through support bracket bearings to engage the actuator. Tap to seat. Install bearing stops (7) to bracket aligning bolt hole in stop with hole in bracket. Secure stops with bolts (3), threads

lubricated with Material No.P03-001, washer (25) (Post PW4ENG 72-498) and nuts (2). TORQUE nuts to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN). Install cotter pins (1) and bend to lock.

NOTE : Under some tolerance conditions, the clearance between the bolt hole in the bearing stop (7) and the bolt (3) is possibly not sufficient for the correct installation of the bolt. If this occurs, (Ref. 75-31-03, P. Block 501) (SB PW4 ENG 75-38).

(3)Secure rod end bearing (24) to compressor stator bellcrank with shoulder bolt (23), threads lubricated with Material No.P03-001, washer (22) and nut (20) fingertight only.

(4)Secure ground cable (11) to actuator (18) with bolt, threads lubricated with Material No.P03-001. TORQUE bolt to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN).

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(5)Remove protective closures. Connect W4P3 harness connector (10) to lower connector on actuator (18). Connect W5P7 harness connector (10) to upper connector on actuator (18).

(6)Install electrical harness connector to IDG air/oil heat exchanger wire harness receptacle. Tighten connector fingertight plus one-eighth turn. Position clamp on harness and secure to clamp on drain tube with screw and nut. TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(7)Rig stator vane actuator (Ref. 75-31-03, P. Block 501).

(8)Connect the stator actuator-hydraulic pressure and return tubes to the stator vane actuator by complying with the following :

(a)Connect the compressor stator-cylinder hydraulic-pressure tube assembly.

R 1 Lubricate the tube nut with Material No.P06-054.

2 Install the tube nut to the larger adapter on the actuator and tighten by hand.

3 TORQUE the tube nut to between 225 and 250 lbf.in. (2.54 and 2.82 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.

(b)Connect the compressor stator-cylinder hydraulic-return tube assembly.

R 1 Lubricate the tube nut with Material No.P06-054.

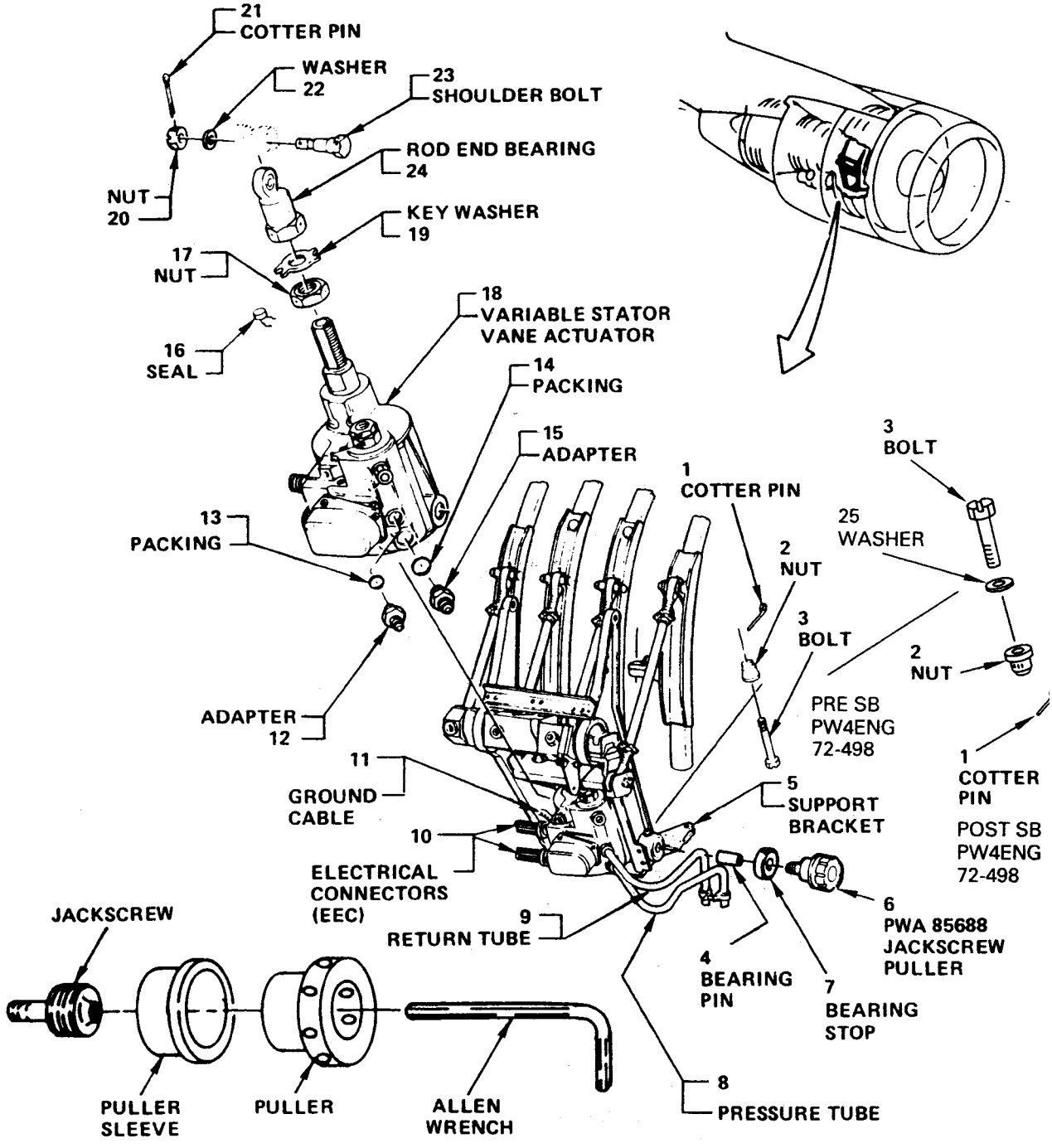
2 Install the tube nut to the smaller adapter on the actuator and tighten by hand.

3 TORQUE the tube nut to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.

(9)Connect drain tube to upper arm of cross tee and to union in stator vane actuator. Position clamp on drain tube and secure to bracket with bolt, washer, and nut. TORQUE nut to between 20 and 25 lbf.in.

(0.23 and 0.28 m.daN). TORQUE tube coupling nuts to between 270 and and 300 lbf.in. (3.05 and 3.39 m.daN).

D. Close-Up and Test
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) On the appropriate FIRE control module, push the fire handle and remove the warning notice.
(3) Remove safety clips and tags, and close circuit breakers : 18KS, 19KS, 20KS, 21KS.
(4) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).



JACKSCREW PULLER – PWA 85688

L-A5021 (0596)

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Variable Stator Vane Actuator
Figure 401

STATOR VANE ACTUATOR - ADJUSTMENT/TEST

1. Rig Variable Stator Vane Actuator - (Manual Procedure)

A. General

WARNING : DO NOT PUT YOUR FINGERS IN THE WAY OF THE LINKAGES, UNISON RINGS, OR LEVERS WHEN YOU OPERATE THE STATOR VANE SYSTEM.

CAUTION : IT IS VERY IMPORTANT TO DO THIS RIGGING PROCEDURE WITH PRECISION. BAD RIGGING CAN CAUSE INCREASED HPC BLADE FATIGUE, INTERNAL ENGINE DAMAGE, OR COMPLETE ENGINE FAILURE.
ALWAYS REMOVE ALL RIG PINS BEFORE YOU MOVE THE STATOR VANE SYSTEM OR DAMAGE CAN RESULT.

NOTE : Also see the hydraulic procedure in Paragraph 2.

B. Equipment and Materials

ITEM	DESIGNATION
A. PWA85395	Rig Pin (Pre SB PW4 ENG 72-246)
B. PWA86097	Rig Pin (Post SB PW4 ENG 72-246)
C. PWA85675	Rig Pin Kit (contains the above rig pins)
D.	Cotter Pin
E.	Seal
F. Material No.P03-001	Oils (Ref. 70-00-00)
G. PWA86344	Holder, Rigging
Referenced Procedures	
- 70-00-00, P. Block 201	Engines
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 75-31-00, P. Block 601	Variable Stator Vane Control System

C. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open the fan cowl doors (Ref. 71-13-00, P. Block 301).

D. Procedure (Ref. Fig. 501, 502)

CAUTION : BE SURE AND USE THE CORRECT BELLCRANK RIG PIN. USE THE LARGER PWA 85395 RIG PIN FOR PRE SB PW4 ENG 72-246 ENGINES. USE THE SMALLER PWA 86097 RIG PIN FOR POST SB PW4 ENG 72-246 ENGINES.
BE SURE THAT THE END OF THE RIG PINS ARE PROPERLY AND FULLY INSTALLED.
BE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANCK RIG PIN. IF YOU LET THE ACTUATOR ROD RETRACT, THE VARIABLE STATOR VANES WILL OVERTRAVEL WHICH MAY RESULT IN HARMFUL STABILITY AND/OR DURABILITY EFFECTS.
TOO MUCH TORQUE WITH THE WRENCH ON THE BELLCRANK DURING THIS RIGGING CAN BEND THE BELLCRANK BRACKET. THIS CAN RESULT IN BAD RIGGING.

(1)If not done, make the initial rod end bearing (3) adjustment as follows.
(a)Turn the actuator piston rod (6) until the flat surface below the rod end bearing (3) hex is approximately 9/16 inch (14.288 mm) from the

flat surface below the actuator rod threads (Ref. Fig. 501) (Sheet 1/2). This is the approximate initial adjustment only.

(2)Adjust the actuator rod end bearing (3) as follows.

(a)Use a standard crowsfoot and wrench on the flats of the bellcrank (1) adjacent to the 5th stage adjuster. Pull down on the wrench until you feel the actuator internal stop. Push up on the wrench until you are off of the actuator internal stop. Pull down on the wrench again. Hold the bellcrank (1) so that the actuator rod (6) is fully extended against the internal stop (vanes open). Hold the actuator fully extended against the internal stop with 300 - 400 lbf.in. (3.39 - 4.51 m.daN) on the crowsfoot.
While you hold the actuator fully extended against the internal stop install the Holder (PWA86344) between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN). Do not TORQUE the bolt too much. Tighten the detail jamnut by hand.

(b)Adjust the rod end bearing (3) so that you can install the PWA 85395 Rig Pin or the PWA 86097 Rig Pin into the bellcrank arm slot (12) and into both holes of the support (11).
NOTE : You must remove the holder (PWA86344) when you adjust the rod end bearing. You must install the holder (PWA86344) to install the rig pin again.

(c)Remove the holder (PWA86344).
Lock the rod end bearing to the actuator rod with the jamnut (5). TORQUE the jamnut (5) to between 460 and 510 lbf.in. (5.20 and 5.76 m.daN).

(d)Push up on the wrench and retract the actuator rod.
Pull down again to fully extend the actuator rod again. Hold the actuator fully extended against the internal stop with 300 - 400 lbf.in. (3.39 - 4.51 m.daN) on the crowsfoot.
While you hold the actuator fully extended against the internal stop, install the holder (PWA86344) between the jamnut and the top of the actuator housing. TORQUE the detail bolt to between 8 and 10 lbf.in. (0.09 and 0.11 m.daN). Do not TORQUE the bolt too much. Tighten the detail jamnut by hand.
Install the rig pin again with the actuator rod fully extended. If you can not install the bellcrank rig pin do the rod end adjustment again in step (2). If you can install the bellcrank rig pin, remove the rig pin and the holder (PWA86344). Lock the jamnut (5) and the rod end bearing (3) with the key washer (4). Bend one set of tabs onto the rod end bearing (3) and the other set onto the jamnut (5).
Install the lockwire and seal (7) (Ref. 70-00-00, P. Block 201).

(3)TORQUE the rod end bearing retaining bolt nut (10) to a minimum of 15 lbf.in. (0.17 m.daN) plus the torque necessary to turn the nut on the bolt (2). Continue and torque the nut until the slot in the nut aligns with the hole in the bolt. This TORQUE must not be more than 22 lbf.in. (0.24 m.daN) plus the torque necessary to turn the nut on the bolt.
Install the cotter pin (9) to the nut. Bend the cotter pin (Ref. 70-00-00, P. Block 201).
CAUTION : BE SURE YOU REMOVE ALL RIG PINS AND TOOLS FROM THE ENGINE OR ENGINE DAMAGE CAN RESULT.

E. Close-Up and Test
(1)Inspect stator vane actuator (SVA) position indication (Ref. 75-31-00, P. Block 601).
(2)Close fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

2. Rig Variable Stator Vane Actuator - (Hydraulic Procedure)

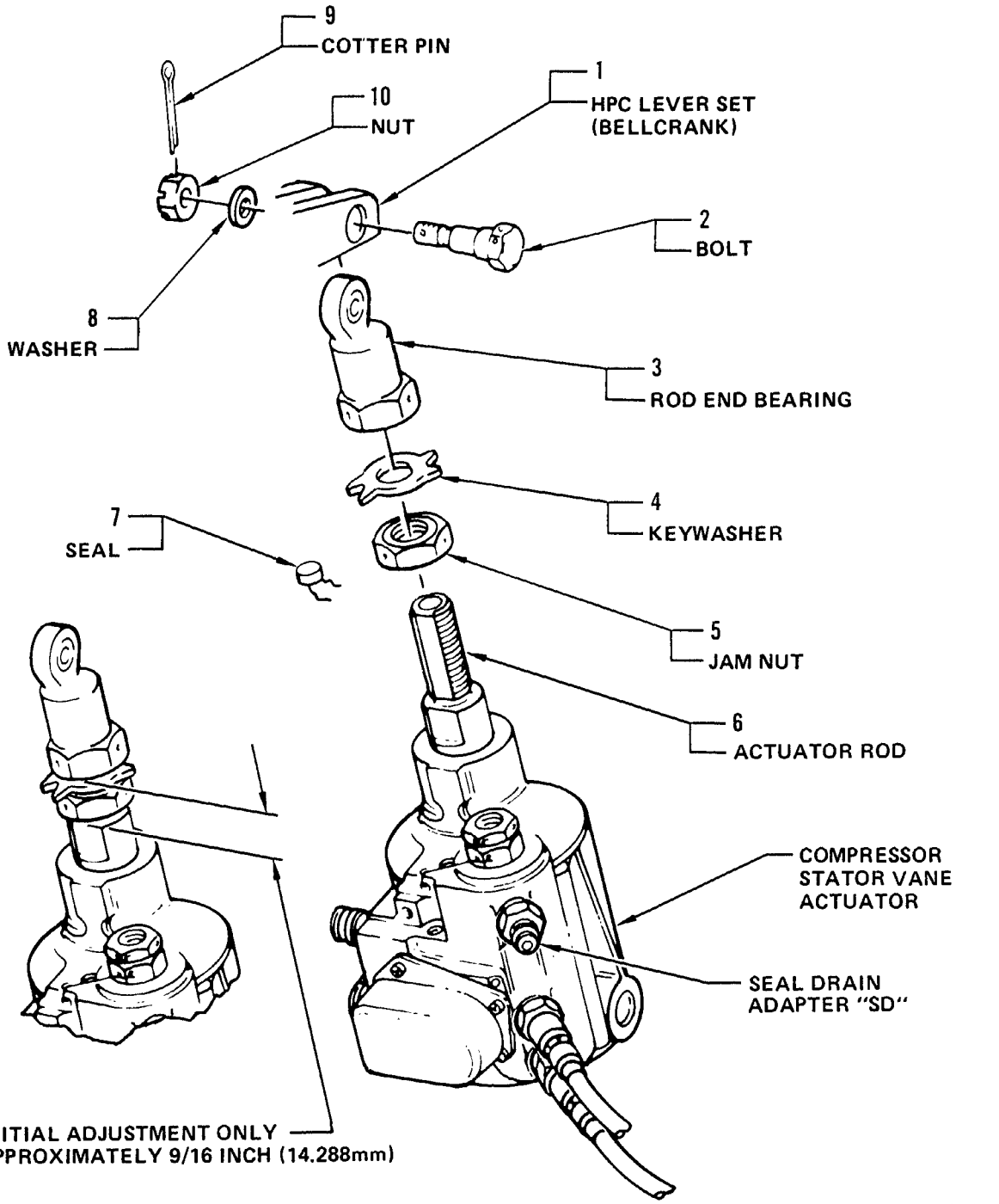
A. General
WARNING : DO NOT PUT YOUR FINGERS IN THE WAY OF THE LINKAGES, UNISON RINGS, OR LEVERS WHEN YOU OPERATE THE STATOR VANE SYSTEM.
CAUTION : IT IS VERY IMPORTANT TO DO THIS RIGGING PROCEDURE WITH PRECISION. BAD RIGGING CAN CAUSE INCREASED HPC BLADE FATIGUE, INTERNAL ENGINE DAMAGE, OR COMPLETE ENGINE FAILURE.
ALWAYS REMOVE ALL RIG PINS BEFORE YOU MOVE THE STATOR VANE SYSTEM OR DAMAGE CAN RESULT.
NOTE : Also see the manual procedure in Paragraph 1.

B. Equipment and Material

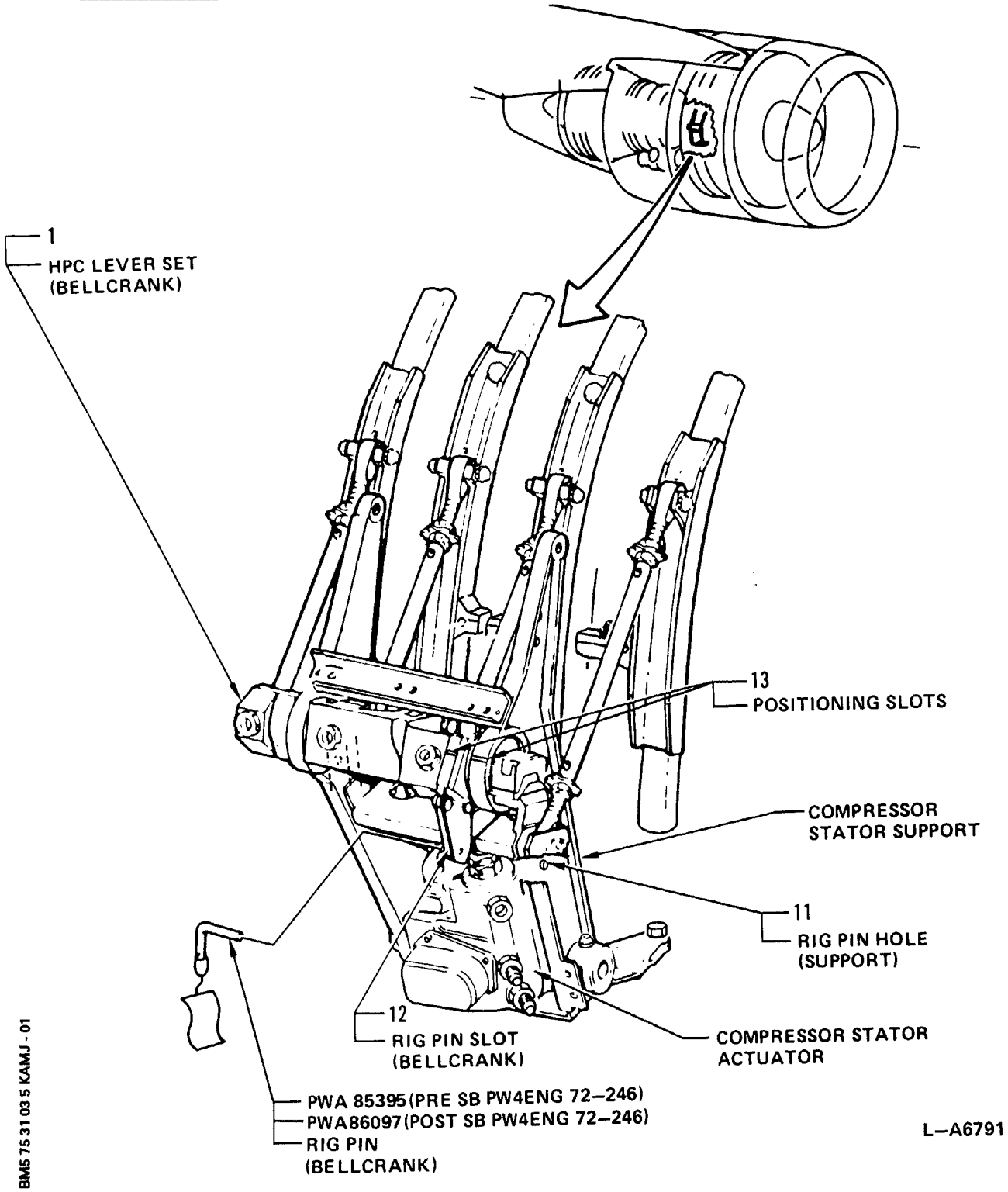
ITEM	DESIGNATION
A. PWA29451	Adapter
B. PWA49030	Hydraulic Cart (Pneumatic) (Optional to CTE 5100)
C. CTE 5100	Hydraulic Cart (Pneumatic) (Optional to PWA 49030)
D. PWA85395	Rig Pin (Pre SB PW4 ENG 72-246)
E. PWA86097	Rig Pin (Post SB PW4 ENG 72-246)
F. PWA86317	Electrical Switch Box (Preferred)
G. PWA85675	Rig Pin Kit (contains the above rig pins)
H.	Cotter Pin
I.	Seal
J. Material No.P03-001	Oils (Ref. 70-00-00)
K. Material No.P03-003	Oils (Ref. 70-00-00)
R L. Material No.P06-054	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engines
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 75-31-00, P. Block 601	Variable Stator Vane Control System

C. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan cowl doors (Ref. 71-13-00, P. Block 301).

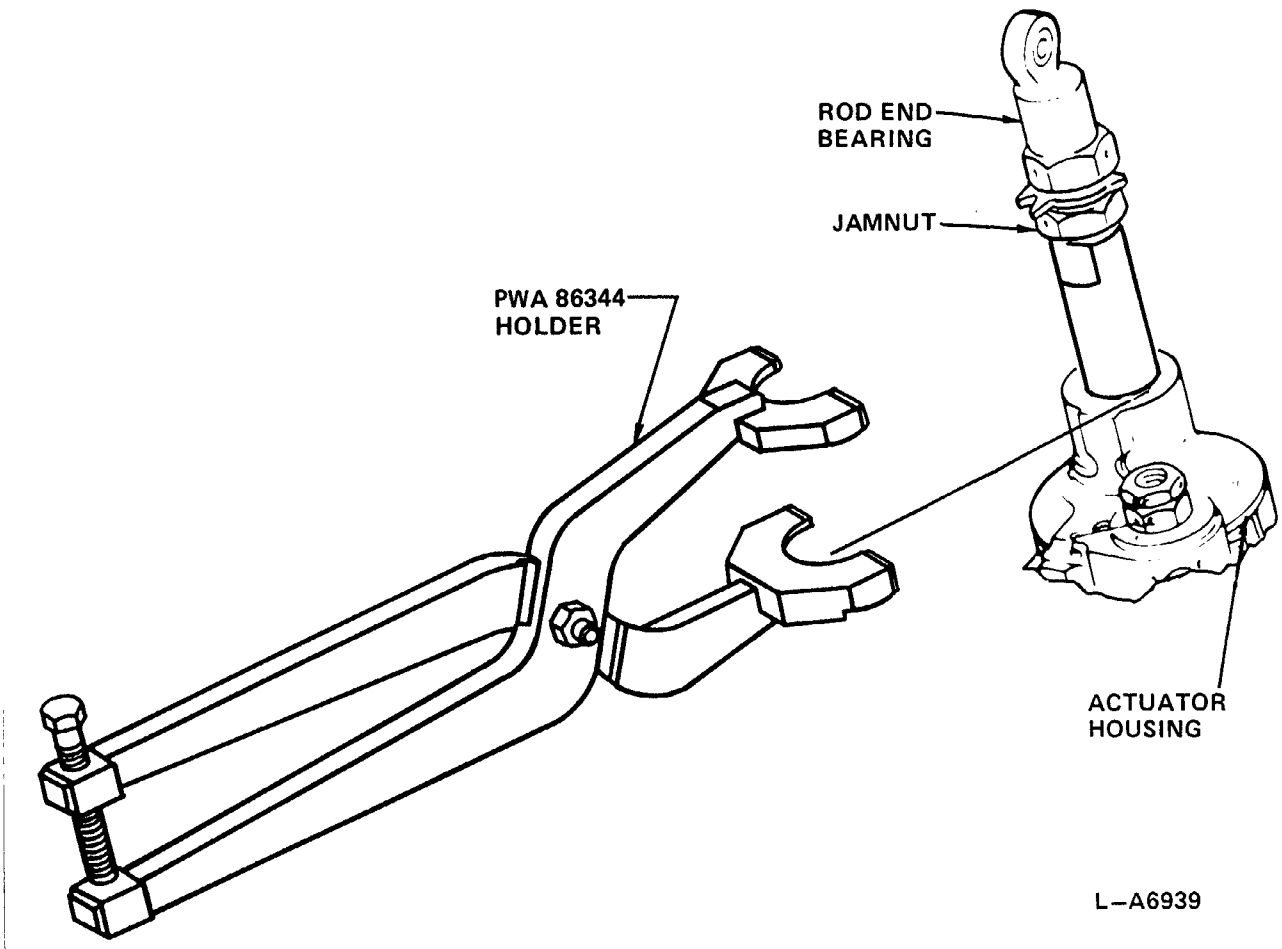
D. Procedure (Ref. Fig. 501, 503)
WARNING : DO NOT LET ENGINE FUEL STAY ON YOUR SKIN FOR A LONG TIME. THE FUEL IS POISONOUS AND CAN GO THROUGH YOUR SKIN. PUT A CONTAINER, MINIMUM CAPACITY OF 5 US GALLONS (19 LITERS), IN POSITION AND



Variable Stator Vane Actuator Rigging - (Manual Procedure)
(Actuator Adjustment) (Sheet 1/2)
Figure 501



Variable Stator Vane Actuator Rigging - (Manual Procedure)
(Actuator Adjustment) (Sheet 2/2)
Figure 501



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PWA86344 Holder Installation
Figure 502

COLLECT THE DRAINED FUEL.

(1)If not done, remove the lockwire and disconnect the compressor stator hydraulic pressure tube (CP12) at both ends. Remove the lockwire and disconnect the compressor stator hydraulic return tube (CR03) at both ends. Loosen both clamp bolts and position the tubes away from the actuator adapters. Install the protection covers.

(2)Install the PWA 49030 or CTE 5100 Hydraulic Cart as follows.

(a)Install the PWA 29451 Adapter to the actuator adapter in the "PF" port.

(b)TORQUE the Adapter (PWA 29451) to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN).

NOTE : Hold the actuator adapter while you torque the tool adapter.

(c)Install the hydraulic pressure hose "A" to the Adapter (PWA 29451).

NOTE : If necessary, use a standard 45 degree or 90 degree adapter or elbow on the end of the hose.

(d)Install the hydraulic return hose "B" to the adapter in the "PFR" port.

(e)TORQUE nuts on hoses "A" and "B" to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

NOTE : Hold the adapters while you torque the nuts.

(f)Remove the hose attached to the top of the pump reservoir and examine the level of fluid in the pump reservoir. Fill with Material No.P03-003 to top if necessary.

(3)Install the PWA 86317 Electrical Switch Box as follows.

NOTE : Although the Electrical Switch Box (PWA 86317) is preferred, if the electrical switch box is not available, you can do a check of the vane rigging without the box. Go to step (4).

(a)If not done, disconnect the W4P3 and the W5P7 harness connectors from the stator vane actuator electrical receptacles "J7" and "J3". Install protection covers to the connectors.

(b)Install the electrical lead from the electrical switch box to the upper receptacle on the stator vane actuator marked "J7".

(4)If not done, make the initial rod end bearing (3) adjustment as follows (Ref. Fig. 501).

(a)Turn the actuator piston rod (6) until the flat surface below the hex of the rod end bearing is approximately 9/16 inch (14.288 mm) from the flat surface below the actuator rod threads (Ref. Fig. 501). (Sheet 1/2). This is the approximate initial adjustment only.

NOTE : You can turn the actuator piston rod for this adjustment only with no hydraulic pressure to the PF port.

(5)Operate the hydraulic cart and fully extend the actuator rod (vanes open) as follows (Ref. Fig. 503)

(a)Before you connect the air source to the hydraulic cart be sure that you

- put the control handle (1) to the neutral position (center)
- turn the hydraulic valve handle (2) to the closed position (perpendicular to flow)
- turn the air supply valve handle (3) to the closed position (perpendicular to flow)
- turn the smaller adjustment knob (5) clockwise to stop. Do not over tighten.

(b)Connect the air source to the air inlet.

(c)Turn the air supply valve handle (3) to the open position (parallel

with flow).

(d)Lift and turn the larger adjustment knob (4) clockwise and raise the air pressure to 25 - 30 psig.

NOTE : The pump ratio is 1 to 10. (30 psig air equals 300 psig hydraulic).

(e)Turn the hydraulic valve handle (2) to the open position (parallel with flow).

(f)Slowly turn the smaller adjusting knob (5) counterclockwise until the air motor turns.

NOTE : The smaller adjusting knob (5) controls the speed of the actuator and the pressure recovery after actuation. Adjust as necessary.
With the control valve (1) in neutral position, hydraulic pressure will be 0 psig on gage.

(g)Put the control handle (1) on the hydraulic cart to the advance position (towards hoses).

NOTE : Hydraulic pressure to the stator vane actuator "PF" port is 250 - 300 psig.

(h)Push the power switch (7) or the electrical box to the on position. Push the actuator switch (6) to the extend position.

NOTE : The actuator piston rod is fully extended at this time (vanes open).

(6)Adjust the actuator rod end bearing (3) as follows (Ref. Fig. 501).

CAUTION : BE SURE THE ACTUATOR ROD STAYS FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF THE ACTUATOR ROD IS ALLOWED TO RETRACT, THE VARIABLE STATOR VANES WILL OVERTRAVEL WHICH MAY RESULT IN HARMFUL STABILITY AND/OR DURABILITY EFFECTS.
BE SURE AND USE THE CORRECT BELLCRANK RIG PIN. USE THE LARGER PWA 85395 RIG PIN FOR PRE SB PW4 ENG 72-246 ENGINES. USE THE SMALLER PWA 86097 RIG PIN FOR POST SB PW4 ENG 72-246 ENGINES.
MAKE SURE THAT THE END OF THE RIG PINS ARE PROPERLY AND FULLY INSTALLED.

(a)Adjust the rod end bearing (3) so you can put the bellcrank PWA 85395 or PWA 86097 Rig Pin into the rig pin slot of the bellcrank arm (12) and into both holes of the support (11) with the hydraulic pressure on.

NOTE : During actuator rod end adjustments only, you can temporarily reduce the hydraulic pressure to 0 psig. You can turn the actuator piston rod for the last small adjustment.

(b)Lock the rod end bearing to the actuator rod with the jamnut (5). TORQUE the jamnut (5) to between 460 and 510 lbf.in. (5.20 and 5.76 m.daN).

CAUTION : REMOVE ALL THE RIG PINS FROM THE UNISON RINGS AND THE BELLCRANK BEFORE YOU CONTINUE OR DAMAGE CAN RESULT.

(c)Remove the bellcrank rig pin. Push the actuation switch (6) (Ref. Fig. 503) on the electrical switch box to retract and extend the actuator several times through full travel. Stop with the rod fully extended. Go to step (e).

NOTE : If an electrical switch box is not available continue with step (d).

(d)If the Electrical Switch Box (PWA 86317) is not available, operate the stator vane system as follows.

1 Turn the air supply valve handle (3) (Ref. Fig. 503) to the closed position (perpendicular to flow).

2 Use a crowsfoot and wrench on the flats of the bellcrank (1) (Ref. Fig. 503). Push the wrench up and move the system to the closed position. Remove the wrench.

3 Operate the hydraulic cart and supply 250 - 300 psig hydraulic pressure to the actuator PF port. Fully extend the actuator rod (6) to the full open position. The stator vane actuator piston is now extended against the internal stop. Do step (d) again one more time.

(e) With the actuator rod (6) extended fully (vanes open), install the bellcrank rig pin in the rig pin slot (12) of the bellcrank arm and both holes on the support (11). If you can not install the rig pin, do the rod end adjustment again in step (6). If you can install the rig pin, lock the jamnut (5) and rod end (3) with the key washer (4). Bend one set of tabs onto the rod end bearing (3) and the other set onto the jamnut (5). Install the lockwire and seal (7) (Ref. 70-00-00, P. Block 201).

(f) TORQUE the rod end bearing retaining bolt nut (10) to a minimum of 15 lbf.in. (0.17 m.daN) plus the torque necessary to turn the nut on the bolt (2). Continue and torque the nut until the slot in the nut aligns with the hole in the bolt. This TORQUE must not be more than 22 lbf.in. (0.24 m.daN) plus the torque necessary to turn the nut on the bolt. Install the cotter pin (9) to the nut. Bend the cotter pin (Ref. 70-00-00, P. Block 201).

CAUTION : REMOVE ALL THE RIG PINS FROM THE UNISON RINGS AND THE BELL-CRANK BEFORE YOU CONTINUE OR DAMAGE CAN RESULT.

(7) Remove the rig pin. Turn the air supply valve handle (3) (Ref. Fig. 503) to the closed position (perpendicular to flow). Disconnect the air supply. Move the control handle (1) to the (center) neutral position. Disconnect the Hoses "A" and "B" from the actuator. Remove the Adapter (PWA 29451) from the "PF" port. Install protection covers to the hose ends.

NOTE : Hold the adapters while you disconnect the hoses and tool adapter.

(8) Push the power switch (7) on the electrical switch box to off. Disconnect the electrical connector from the actuator.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(9) Align the keyway and connect the W4P3 and the W5P7 harness connectors to the stator vane actuator receptacles "J7" and "J3" (Ref. 70-00-00, P. Block 201).

(10) Install the compressor stator cylinder hydraulic pressure tube assembly (CP12).

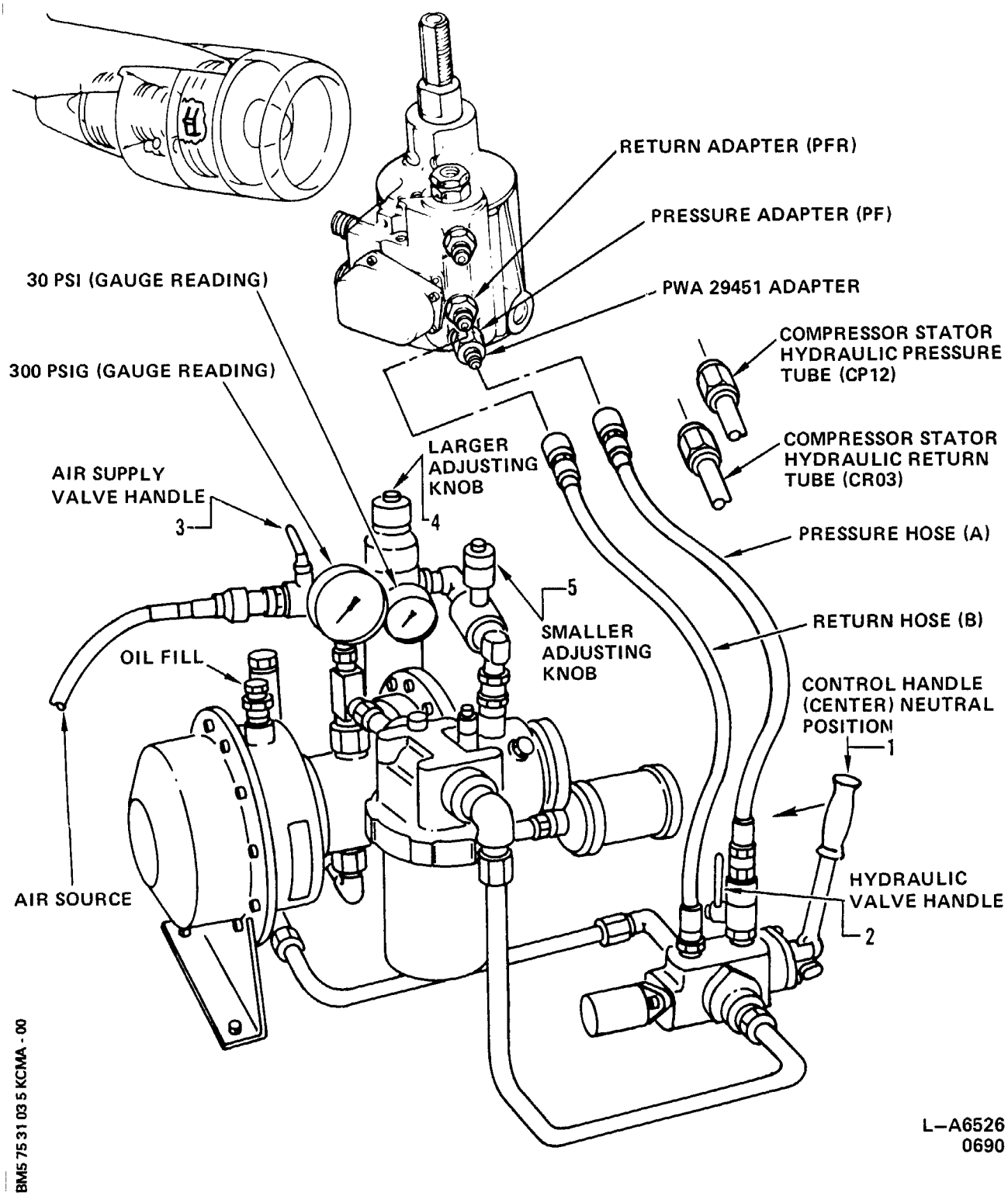
(a) Remove the protection covers. Lubricate the tube adapter threads at
R each end with Material No.P06-054.

(b) Install the tube nuts to the larger adapter on the actuator and to the hydraulic manifold tee handtight only.

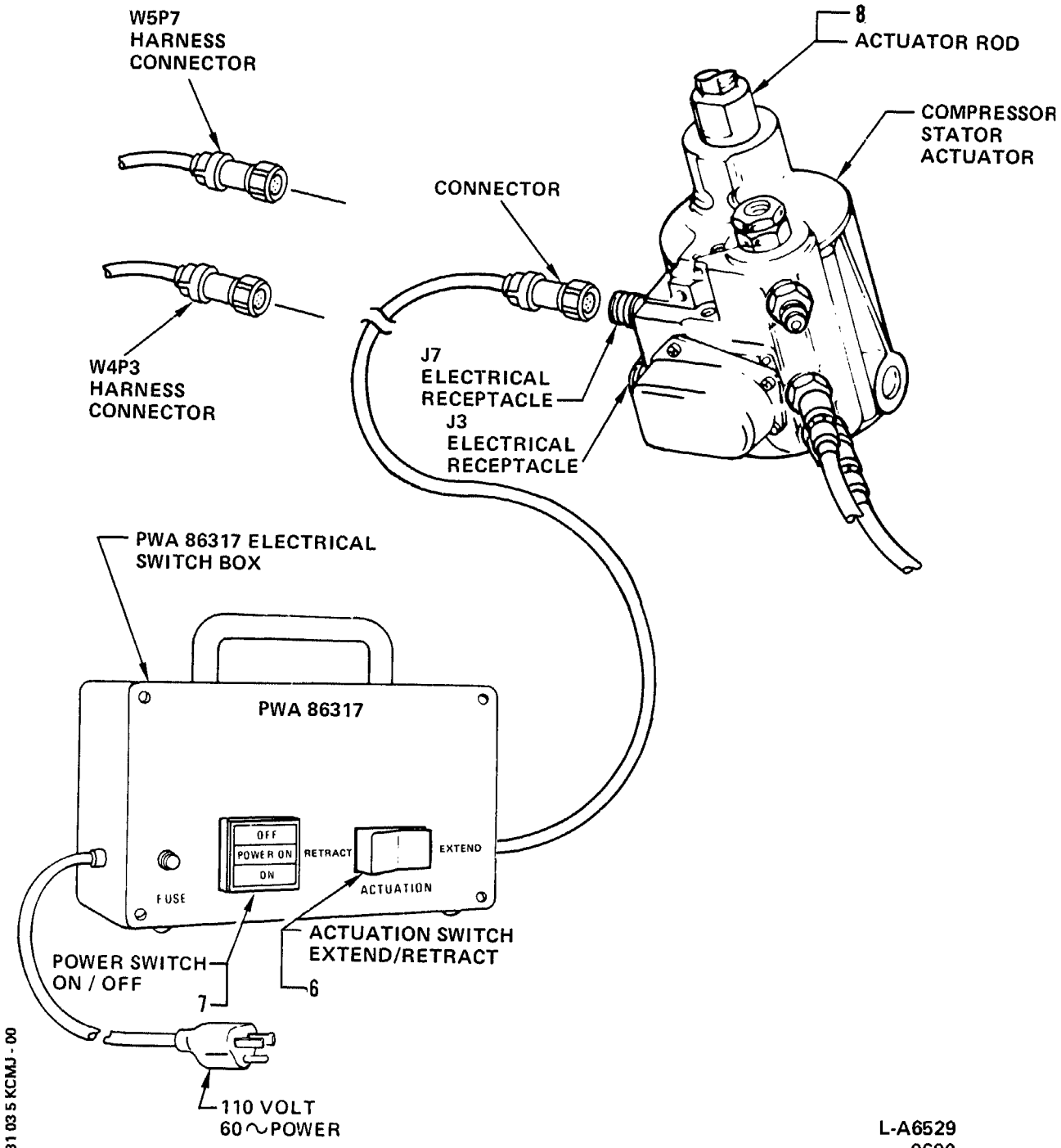
(c) TORQUE the clamp bolt, lubricated with Material No.P03-001 to between

36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(d)TORQUE the tube nuts to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN) and wirelock.
(11)Install the compressor stator cylinder hydraulic return tube assembly (CR03).
(a)Remove the protection covers. Lubricate the tube adapter threads at each end with Material No.P06-054.
(b)Install the tube nuts to the smaller adapter on the actuator and to the inlet return manifold tee handtight only.
(c)TORQUE the clamp bolt, lubricated with Material No.P03-001 to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(d)TORQUE the tube nuts to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN) and wirelock.
CAUTION : BE SURE YOU REMOVE ALL RIG PINS AND TOOLS FROM THE ENGINE OR ENGINE DAMAGE CAN RESULT.

E. Close-Up and Test
(1)Inspect stator vane actuator (SVA) position indication (Ref. 75-31-00, P. Block 601).
(2)Close fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



Variable Stator Vane Actuator Rigging (Hydraulic Procedure)
(PWA 49030 or CTE 5100 Hydraulic Cart Installation) (Sheet 1/2)
Figure 503



Variable Stator Vane Actuator Rigging (Hydraulic Procedure)
(PWA 86317 Electrical Switch Box Installation) (Sheet 2/2)
Figure 503

2.5 BLEED SYSTEM - DESCRIPTION AND OPERATION

1. General
The 2.5 bleed system provides increased compressor stability during starting, transient and reverse thrust operation.

2. Description (Ref. Fig. 001)
The bleeds are scheduled as a function of thrust lever angle, low rotor speed (N1) high rotor speed (N2) Mach number, engine inlet total temperature (T2) and altitude

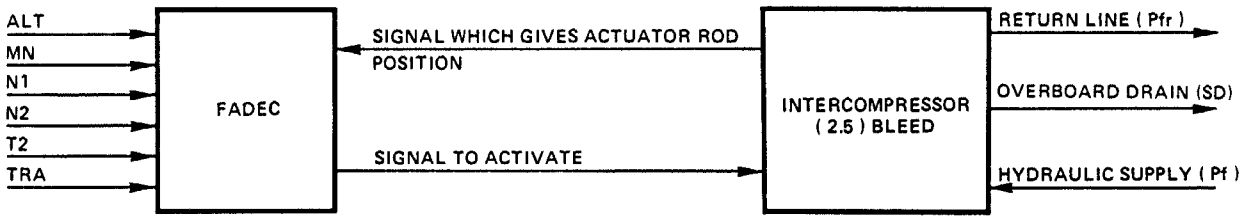
3. Operation (Ref. Fig. 002, 003)
The 2.5 bleed actuation is achieved by an actuator located at approximately the 7 o'clock position, at the rear of fan exit case.

A. The unit consists of a pilot valve, actuator piston, torque motor, and a dual rotary variable transducer.
The unit has three ports : supply (PF), return (PFR), and an overboard drain (SD) for actuator red seal drain.

B. The Full Authority Digital Engine Control (FADEC) modulates the 2.5 bleed valve actuator to a schedule determined by thrust lever angle, low rotor speed (N1), high rotor speed (N2), mach number, engine inlet total tempeature (T2) and altitude. The actuator piston linear motion is transmitted by mechanical linkage and a series of cams and rollers to position the 360 degree translating ring type 2.5 bleed valve.

C. During engine start the bleed valve is translated to the full open position venting low pressure compressor discharge (4th stage compressor) air into the fan stream. The valve is fully open at idle. As engine power is increased the valve is modulating to its fully closed position.
It is commanded to its full open position during rapid engine decelerations, reverse thrust operation or if an impending surge is detected.

D. The FADEC interfaces with the intercompressor (2.5) bleed actuator through a pilot valve positioned by a redundant coil torque motor. Intercompressor (2.5) bleed actuator position is sensed by dual rotational variable transformers (RVT) and fed back to the FADEC. The pilot valve, torque motor and RVT's are integral with the intercompressor (2.5) bleed actuator assembly. The actuator is powered by hydraulic pressure supplied by the fuel pump. In the event of loss of electrical signal to the actuator the system is designed to open the 2.5 bleed valve.



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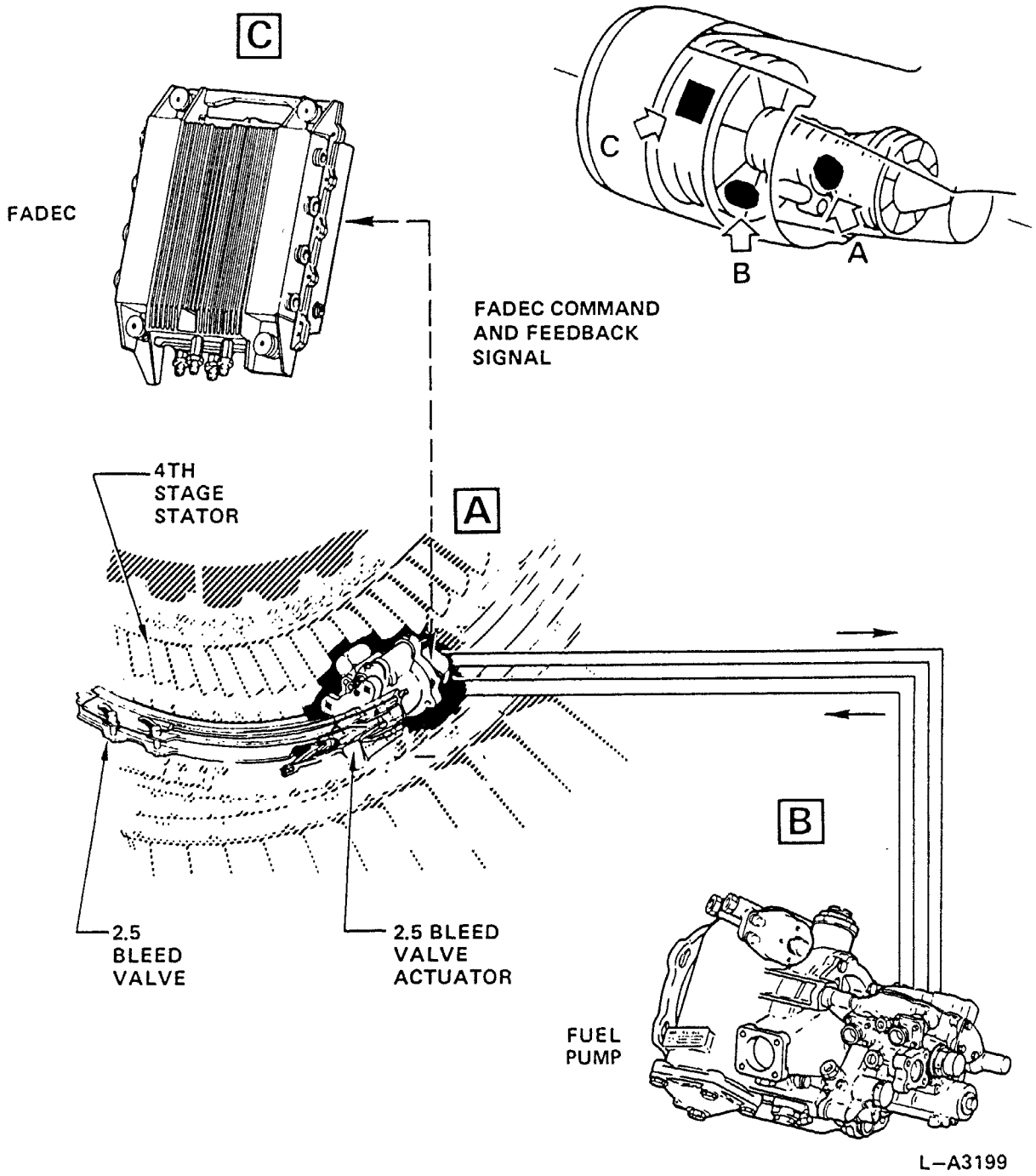
2.5 Bleed Control
Figure 001



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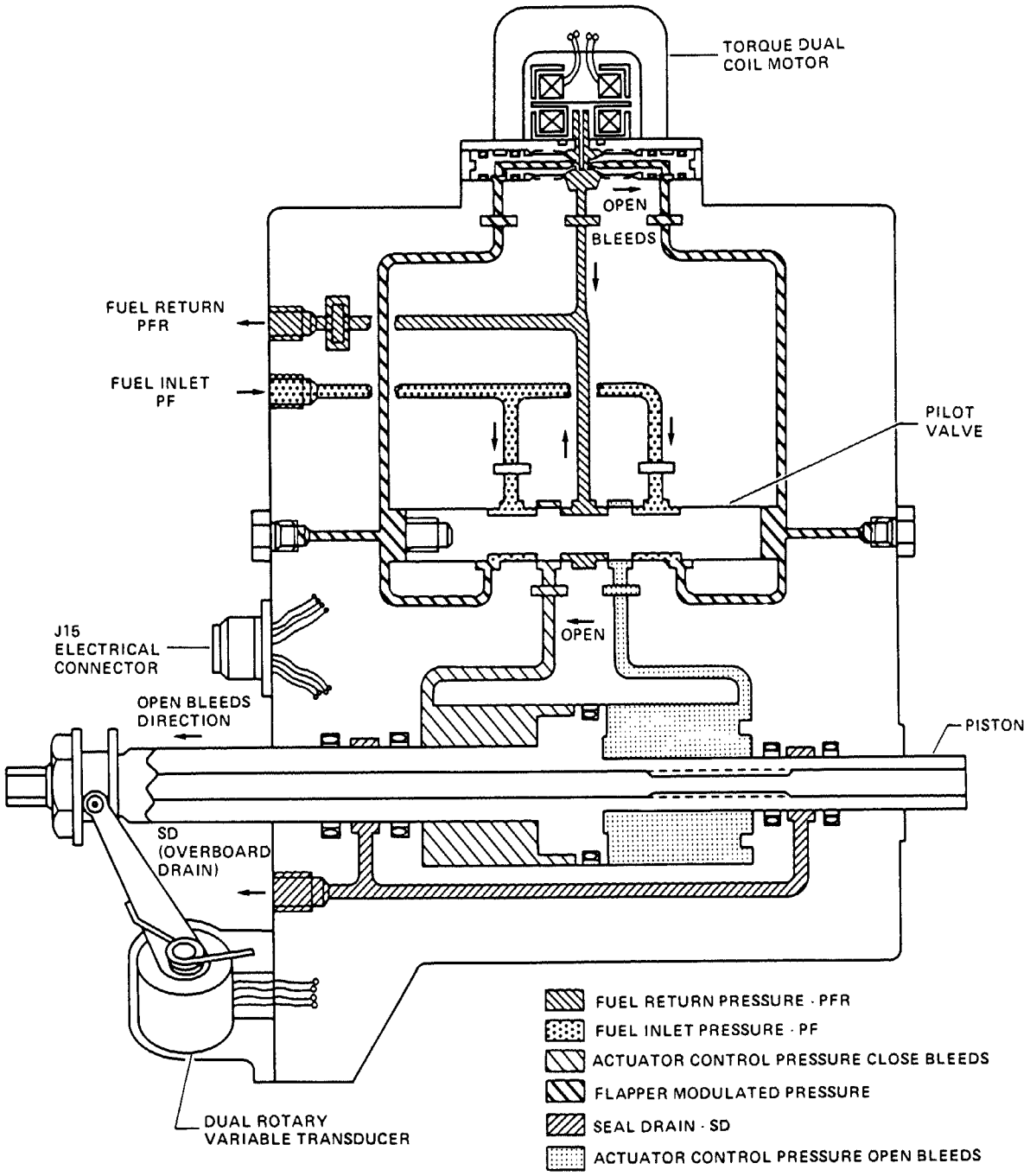
Intercompressor 2.5 Bleed System
Figure 002



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Modulated 2.5 Compressor Bleed Actuator
Figure 003

2.5 BLEED SYSTEM - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Flashlight
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 601	Fan Exit Liner Segments
- 75-32-01, P. Block 401	2.5 Bleed Valve Actuator

2. Inspect Intercompressor 2.5 Bleed System

A. Job Set-Up

(1) Open, safety and tag the appropriate circuit breakers and open the left thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Procedure (Ref. Fig. 601, 602)

(1) Inspect intercompressor 2.5 bleed valve actuator for leakage. Any leakage requires replacement of actuator (Ref. 75-32-01, P. Block 401).

(2) Visually inspect 2.5 bleed valve linkage assembly through the (2) bleed duct ports located on each side of No. 7 case strut using a fluorescent white light and mirror. Inspect for security of linkage connecting pins and general condition of linkage assembly. Excessively worn, damaged or deformed parts which could cause improper functioning of bleed system require replacement (Ref. Fig. 601).

(3) Visually inspect the 2.5 bleed system seals

(a) Find the bleed valve air exit ports located aft of the fan exit guide vane inner platforms.

NOTE : The top locations have bleed valve screens located inside the ports above the horizontal centerline.

(b) Use a flashlight and examine the 2.5 bleed system seals. (See Table 601).

1 The 2.5 bleed system seals are orange in color. You cannot see the seals all the way around. Inspect the areas that you can see.

2 Cut off any part of the seal that is hanging out of a bleed valve slot.

EXAMINE	RESULTS	DISPOSITION
(a) Loss of attachment or loss of seal material	Any amount of missing seal material or disbonded seal material	Bleed system is serviceable with any amount of missing seal material. Bleed system is serviceable after disbonded seal material is removed.

R

Inspection of 2.5 Bleed System Seals
Table 601

(4)Visually inspect the 2.5 Bleed Screen (Ref. Fig. 602).
CAUTION : IF PIECES OR ENTIRE SECTIONS OF A SCREEN ARE MISSING, BEFORE ANY MAINTENANCE WORK IS TO BE PERFORMED IN THE AREA OF THE SREENS, IT IS RECOMMENDED THAT THE SCREEN PORTS BE COMPLETELY TAPED WHEN PERFORMING MAINTENANCE.
(a)Find the eight bleed valve screens located inside the ports above the horizontal centerline and visually inspect for broken, distorted or completely missing screen (See Table 602).

EXAMINE	RESULTS	DISPOSITION
(a)Screen Distortion	Any Amount Permitted	Bleed screen is serviceable.
(b)Missing Screen Material	Any Amount Permitted	Full screens can be missing. Remove loose or about to be loose or broken off pieces. Tape over any port before you do any maintenance where there is missing screen material.

Inspection of 2.5 Bleed Screen
Table 602

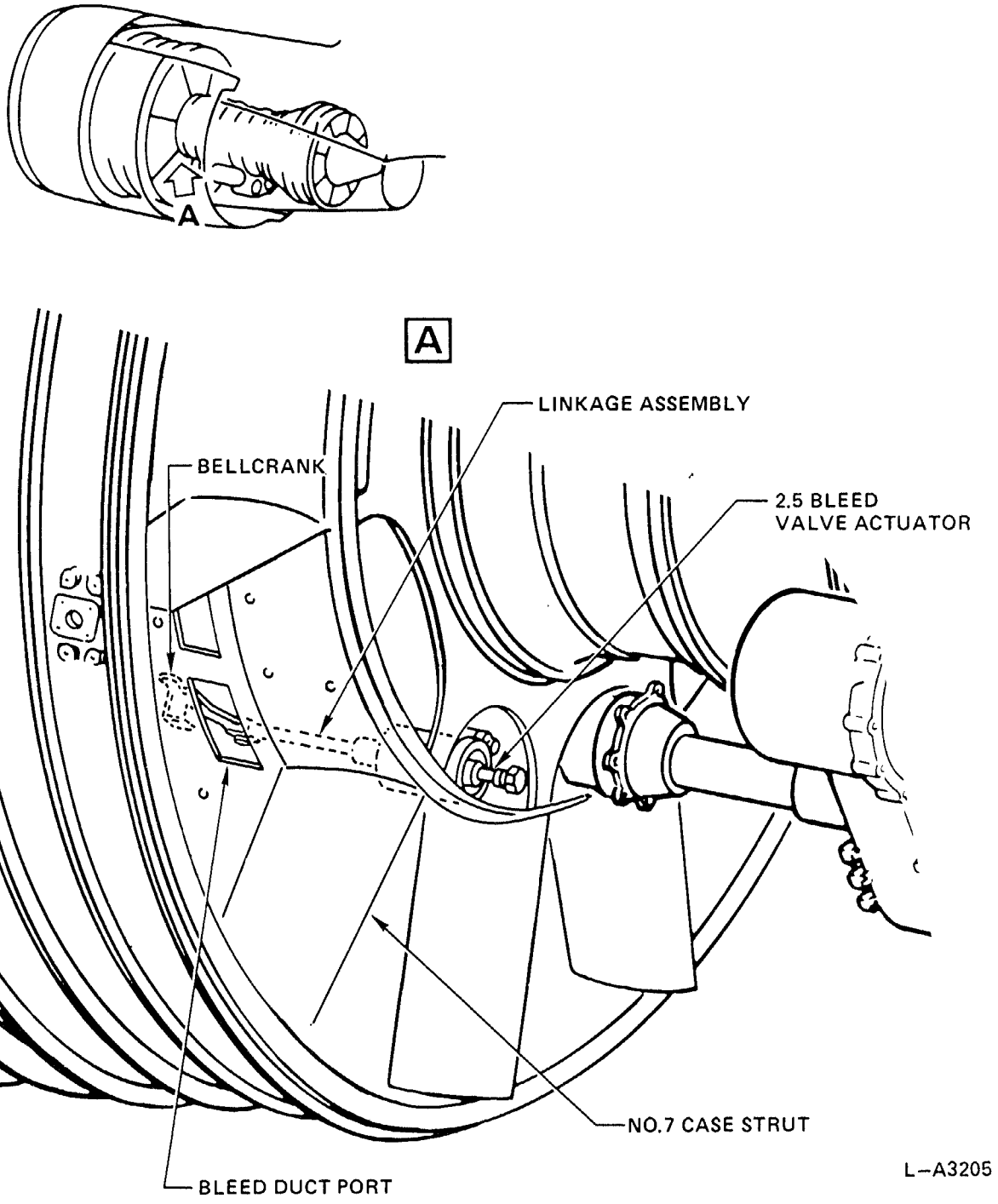
(5)Visually inspect bellcrank-to-bracket pivot pins. (Ref. Fig. 603)
R Reference Alert Service Bulletin No. PW4ENG A75-51.
(a)View pins through the access ports and apply finger pressure towards the forward position and visually inspect for broken and partially missing pins (See Table 603).
(6)Use a fluorescent white light and a mirror and make an Inspection of the 2.5 bleed valve linkage for missing Cam followers, rubber damper rollers and bearing pads.
(a)No more than two cam followers are permitted missing at any location. This condition is permitted until the engine is scheduled for removal, at that time SB PW4ENG 72-659 and SB PW4ENG 72-660 are recommended.
(b)Pieces of rubber, or total rubber can be missing in any and all rubber damper locations. This condition is permitted until the engine is scheduled for removal, at that time SB PW4ENG 72-659 and SB PW4ENG 72-660 are recommended.
(c)Any amount of bearing pads can be missing at any location. This condition is permitted until the engine is scheduled for removal, at that time SB PW4ENG 72-659 and SB PW4ENG 72-660 are recommended.

EXAMINE	RESULTS	DISPOSITION
(a)Broken Pins	0.250 Inch (6.350 mm)	Continue-In-Service limitation of 350

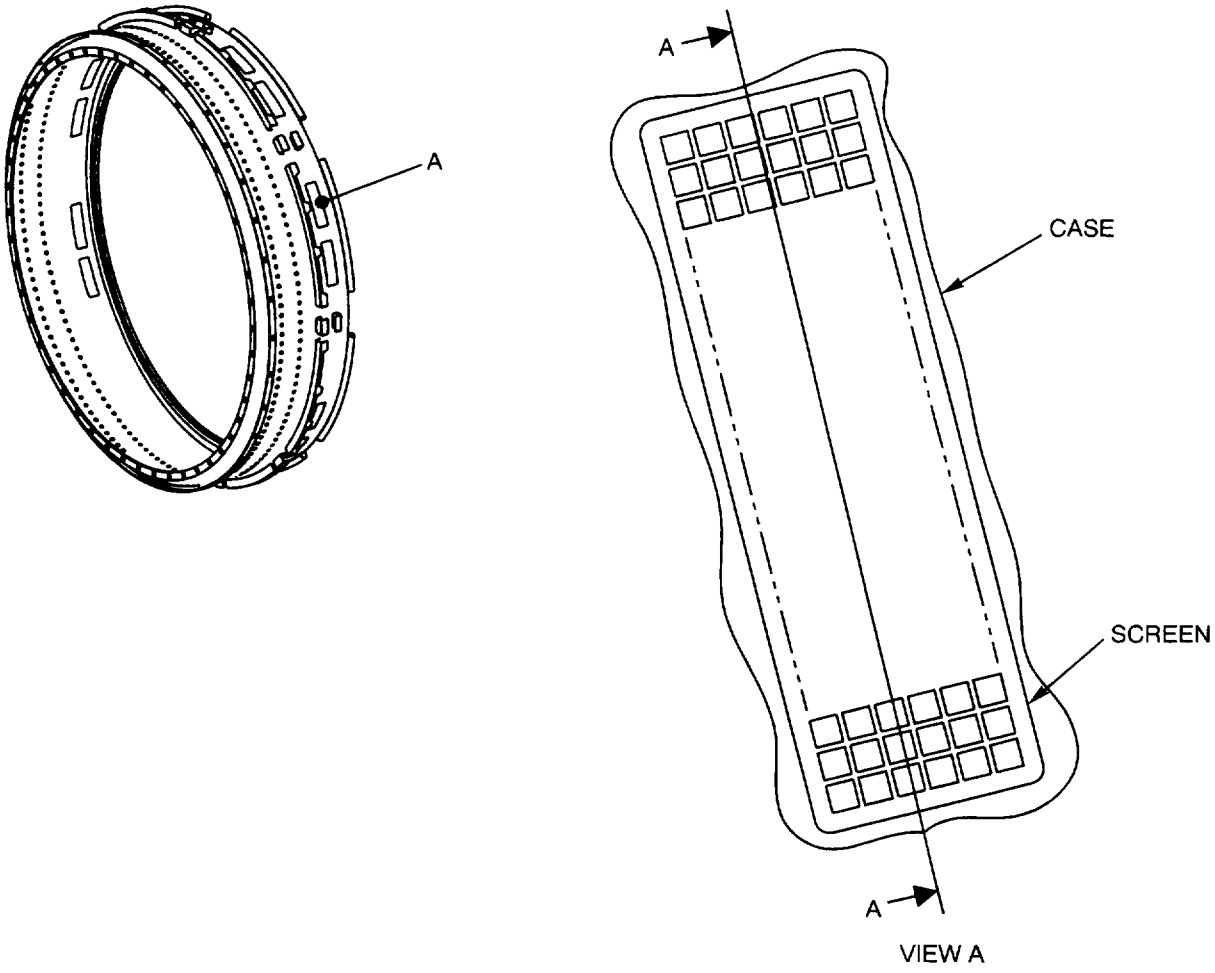
EXAMINE	RESULTS	DISPOSITION
R R	Maximum Amount Of Pin Head Movement Permitted.	Hours. See Alert Service Bulletin PW4ENG A75-51.

Inspection of 2.5 Bleed Valve Pivot Pins
Table 603

C. Close-Up
(1)Close left thrust reverser cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



2.5 Bleed System Linkage Inspection
Figure 601



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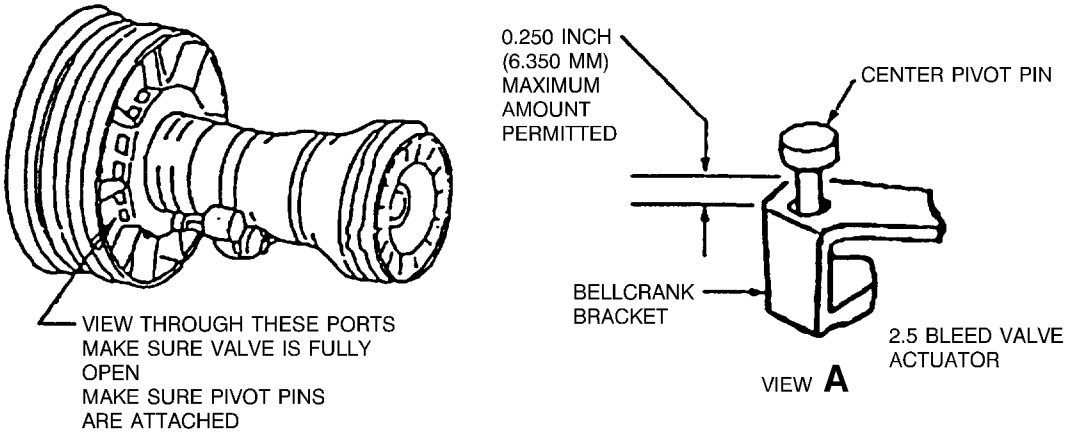
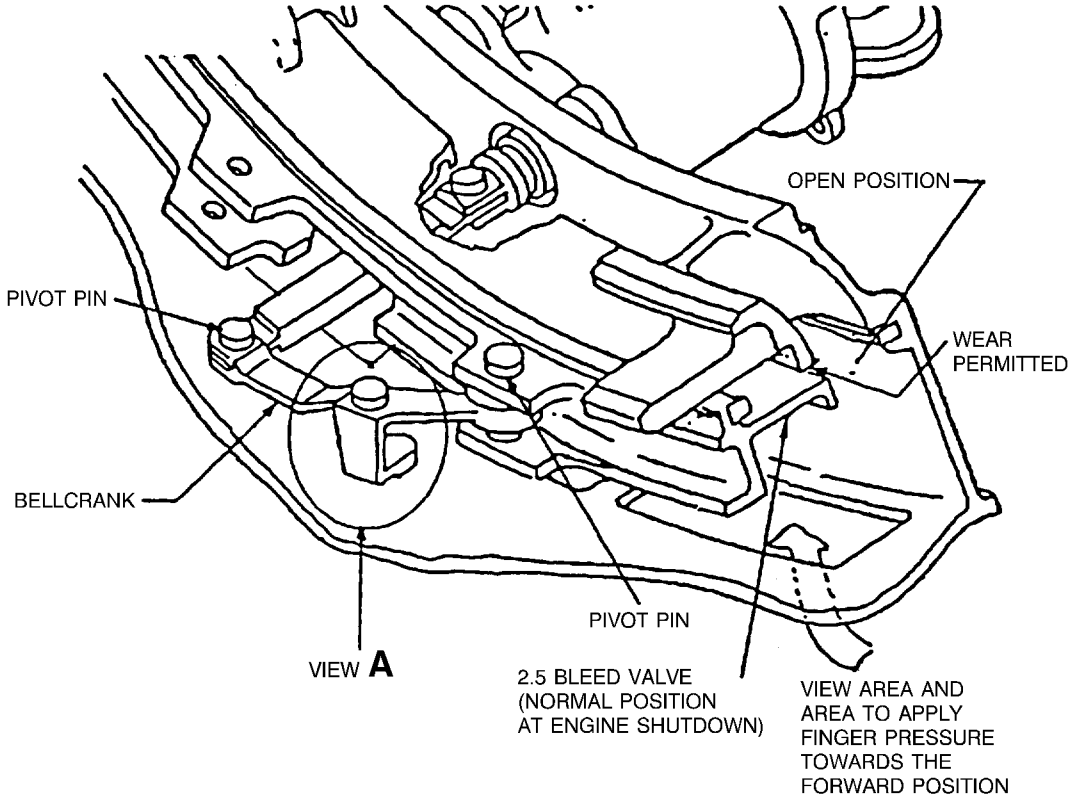
PW V

2.5 Bleed System Screen Inspection
Figure 602


VIEW THROUGH THESE PORTS
MAKE SURE VALVE IS FULLY OPEN
MAKE SURE PIVOT PINS ARE ATTACHED
0.250 INCH (6.350 MM) MAXIMUM AMOUNT PERMITTED
CENTER PIVOT PIN
BELLCRANK BRACKET
2.5 BLEED VALVE ACTUATOR
VIEW A



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2.5 Bleed System Pivot Pin Inspection
Figure 603

2.5 BLEED VALVE ACTUATOR - MAINTENANCE PRACTICES

1. Hydraulic Pump Service and Operation

A. General

(1) Use this procedure for the service or operation of the PWA49030 or the CTE5100 Hydraulic Pump. The CTE5100 Pump replaces the PWA49030 Pump.

(2) Either Hydraulic Pump is available with an air driven pneumatic motor or an electric motor. All pumps must be serviced with clean filtered Calibrating Fluid (Material No.P03-003).

(3) These pumps are used for many applications and for other engine models. Make sure that you have the necessary adapters, elbows, and fittings for your application. The adjustment procedure specifies the correct adapters to connect the hoses to the actuator.

(4) This procedure has the tasks necessary to operate the pneumatic motor or electric motor driven pumps.

B. Equipment and Materials

ITEM	DESIGNATION
(1) CTE5100	Hydraulic Pump (Optional to PWA49030)
(2) PWA49030	Hydraulic Pump (Optional to CTE5100)
(3) Material No.P03-003	Oils (Ref. 70-00-00)

C. Pump Operation - Pneumatic Motor Driven (Ref. Fig. 201)

(1) Check the hoses as follows :

(a) Make sure the return hose is connected to the return adapter of the actuator.

(b) Make sure the pressure hose A or B is connected to the pressure adapter of the actuator.

(c) Install a No. 6 plug to the end of the hose that is not being used.

(d) Tighten the plug with a wrench.

NOTE : Do not use aluminum or plastic dust covers. Make sure you use fittings that will seal the hose when you put pressure to the hose.

(2) Service the pump reservoir as follows :

(a) Examine the sightglass on the side of the pump reservoir.

(b) If you can not see the fluid level, service the pump as follows :

1 Remove the fill cap.

2 Add clean filtered Calibrating Fluid (Material No.P03-003) until full.

3 Install the fill cap.

(3) Before you connect an air supply to the pump, do a check of the controls and valves as follows :

(a) Turn the Air Supply Valve to CLOSED (perpendicular to flow).

(b) Lift and turn the Hydraulic Pressure Adjustment Knob counterclockwise towards OFF (MINUS) to stop.

(c) Move the Hydraulic Flow Control Valve to NEUTRAL (middle position).

(4) Connect an air supply hose to the pump air supply connector.

WARNING : MAKE SURE ALL PERSONS AND TOOLS ARE AWAY FROM THE MECHANICAL

PARTS OF THE SYSTEM THAT YOU ARE ADJUSTING. WHEN YOU START THE PUMP, THE ACTUATOR CAN MOVE. IF YOU DO NOT DO THIS, YOU CAN CAUSE INJURY OR DAMAGE TO THE ENGINE.

(5)Operate the pump to supply hydraulic pressure to the applicable actuator as follows :
(a)Turn the Air Supply Valve to OPEN (parallel to flow).
NOTE : The air flow out of the air vent will stop when the valve is full open. Do not install a plug to the vent hole.
(b)Lift and turn the Hydraulic Pressure Adjustment Knob towards ON (PLUS) only until the correct pressure is on the larger hydraulic pressure gage.
(c)See the adjustment procedure for the correct pressure.
(d)Move the Hydraulic Flow Control Valve to pressurize the hose that is connected to the actuator.
(e)Lift and turn the Hydraulic Pressure Adjustment Knob as necessary to keep the correct pressure during the adjustment.
(6)Use the applicable Electrical Control Box to extend and retract the actuator.
NOTE : You do not use the pump valves to extend or retract the actuator.
(7)After the adjustment, disconnect and remove the equipment as follows :
(a)Move the Hydraulic Flow Control Valve to NEUTRAL (middle position).
(b)Lift and turn the Hydraulic Pressure Adjustment Knob counterclockwise towards OFF (MINUS) to stop.
(c)Turn the Air Supply Valve to CLOSED (perpendicular to flow).
(d)Disconnect the air supply.
(e)Move the Hydraulic Flow Control Valve from A to B a few times to bleed any pressure in the hoses.
(f)Disconnect the hoses from the actuator and install protection covers to the ends.

D. Pump Operation - Electric Motor Driven (Ref. Fig. 202)
(1)Check the hoses as follows :
(a)Make sure the return hose is connected to the return adapter of the actuator.
(b)Make sure the pressure hose A is connected to the pressure adapter of the actuator.
(c)Install a No. 6 cap to the B1 and B2 pressure port adapters (not used) on the pump.
(d)Tighten the caps with a wrench.
NOTE : Do not use aluminum or plastic dust covers. Make sure you use fittings that will seal the adapters if pressurized.
(2)Service the pump reservoir as follows :
(a)Remove the reservoir fill plug.
(b)If you cannot see the fluid level, service the pump as follows :
1 Add clean filtered Calibrating Fluid (Material No.P03-003) until full.
2 Install the fill cap.
(3)Before you connect the pump to the power supply, set the controls and valves as follows :
(a)Turn the Power Supply Switch to OFF.

(b)Turn the Supply Valve B and Bypass Valve B clockwise to CLOSED to stop.
(c)Turn the Supply Valve A and Bypass Valve A to OPEN (counterclockwise approximately 10 turns).
(d)Turn the Gauge Valve to the A position.
(e)Move the Hydraulic Flow Control Valve to the NEUTRAL (middle) position.

(4)Connect the power cord to the power supply.

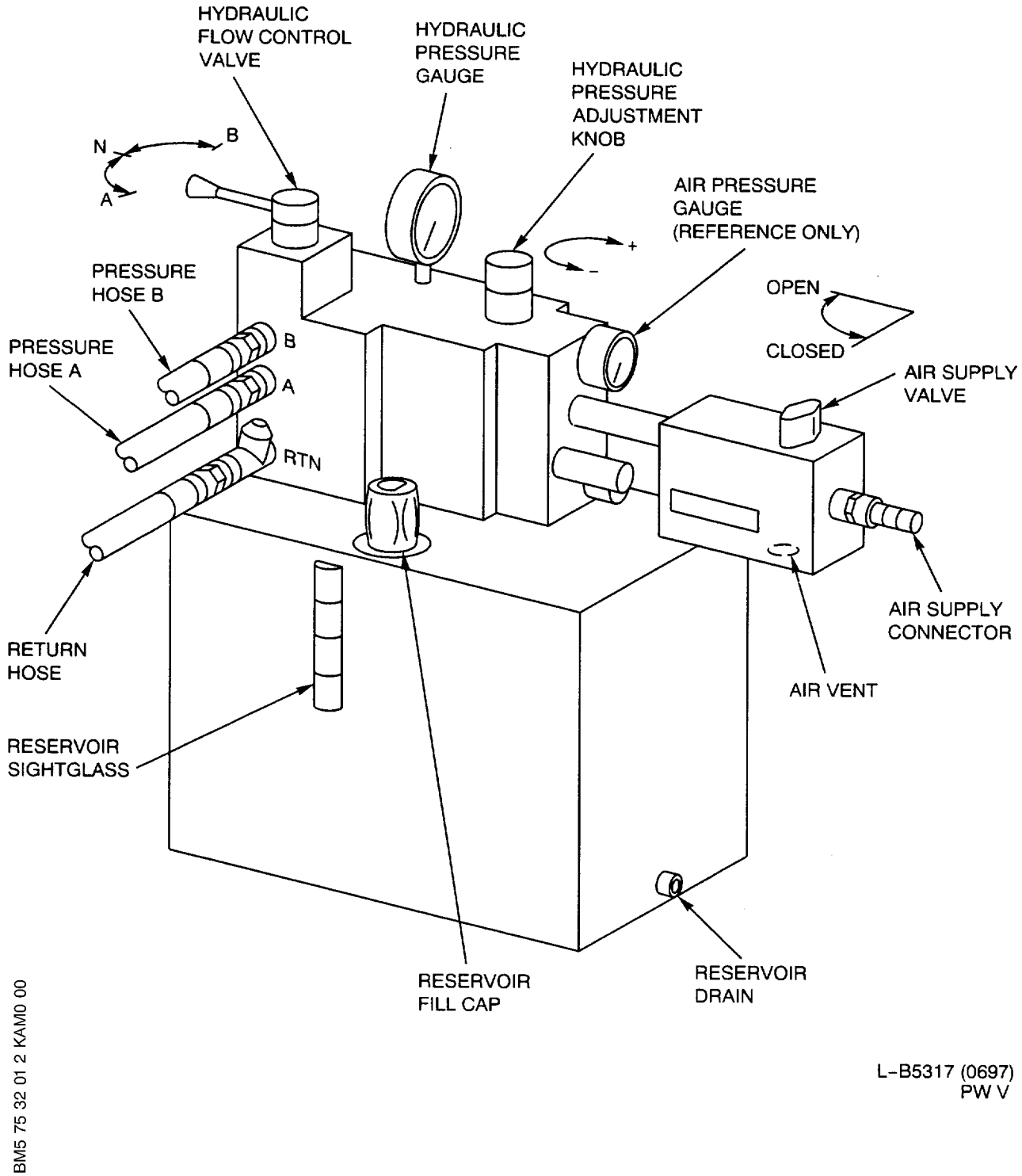
WARNING : MAKE SURE ALL PERSONS AND TOOLS ARE AWAY FROM THE MECHANICAL PARTS OF THE SYSTEM THAT YOU ARE ADJUSTING. WHEN YOU START THE PUMP, THE ACTUATOR CAN MOVE. IF YOU DO NOT DO THIS, YOU CAN CAUSE INJURY OR DAMAGE TO THE ENGINE.

(5)Operate the pump to supply hydraulic pressure to the applicable actuator as follows :
(a)Turn the Power Switch to ON.
(b)Move the Hydraulic Flow Control Handle to the A position.
(c)Slowly close the Bypass Valve A (clockwise) only until the correct pressure is on the hydraulic pressure gauge.
1 See the adjustment procedure for the correct pressure.

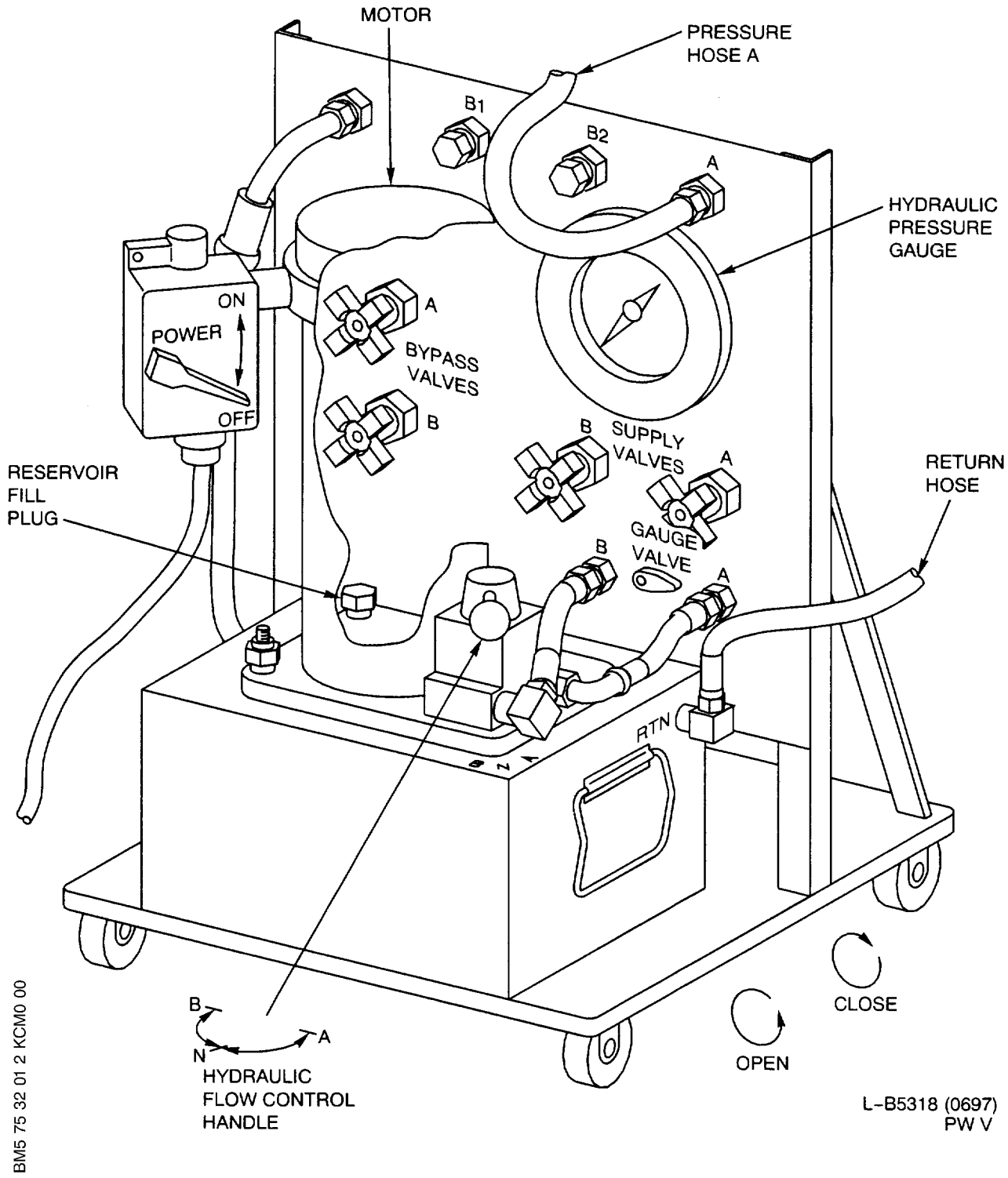
(6)Use the applicable Electrical Control Box to extend and retract the actuator per the adjustment task.

NOTE : You do not use the pump valves to extend or retract the actuator.

(7)After the adjustment, disconnect and remove the equipment as follows :
(a)Open the Bypass Valve A (counterclockwise) until the pressure on the hydraulic pressure gauge is 0.
(b)Move the Hydraulic Flow Control Valve to NEUTRAL (middle position).
(c)Close the Supply Valve A (to clockwise stop).
(d)Turn the Power Supply Switch to OFF.
(e)Disconnect the power cord from the power supply.
(f)Disconnect the hoses from the actuator and install protection covers to the ends.



Hydraulic Pump (Pneumatic Motor Driven)
Figure 201



Hydraulic Pump (Electric Motor Driven)
Figure 202

2.5 BLEED VALVE ACTUATOR - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Closures
C.	Torque Wrench
D.	Bergen Mechanical Crimper (optional) Model M303, M305 or M307.
E. PWA85928	Torque Adapter
F. Material No.P03-001	Oils (Ref. 70-00-00)
G. Material No.P05-289	Special Materials (Ref. 70-00-00)
H. Material No.P05-291	Special Materials (Ref. 70-00-00)
J. Material No.P05-292	Special Materials (Ref. 70-00-00)
R K. Material No.P06-054	Lubricants (Ref. 70-00-00)
R L.	Container Minimum Capacity of 5 US Gallons (19 liters)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments
- 75-32-01, P. Block 501	2.5 Bleed Valve Actuator

2. Procedure

A. Job Set-Up

(1) On the FIRE control module (overhead panel) of the engine concerned pull the fire handle and install a warning notice to prohibit actuation in normal position (pushed) while maintenance is in progress.

(2) Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69

(3) Open left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(4) Remove the fan exit liner segment (inner rear) that is at 7 o'clock (Ref. 72-23-05, P. Block 401).

B. Removal (Ref. Fig. 401)

(1) Remove lockwire from tube coupling nuts on 2.5 bleed valve actuator. Disconnect tube coupling nuts from adapters (7) and (8) on actuator. Collect residual fuel.

NOTE : Be prepared to catch fuel in container with a minimum capacity of 5 US gallons (19 liters).

(2)Loosen and remove union and packing from coupling nut of drain tube assembly at 2.5 bleed valve actuator.
Discard packing.

(3)Loosen coupling nut of attaching tube connector.

(4)Loosen coupling nut connecting drain tube assembly to tee connection.

(5)Loosen and remove bolt, washer, and nut from clamp assembly.

(6)Reposition drain tube assembly to provide clearance for 2.5 bleed valve actuator removal.

(7)For engines with the 2.5 bleed actuator support bracket (POST SB PW4ENG 75-84) do the following.

(a)Remove the three bolts and nuts that attach the support bracket to a bracket on Flange E.

(b)Remove the lockwire and the two bolts that attach the support bracket to the 2.5 bleed actuator.
Remove the bracket from the actuator.

(8)Disconnect W3P15 harness connector and loop clamp.

CAUTION : TO AVOID SHOULDER BOLT DAMAGE, BE AWARE THAT SHOULDER BOLT IS LEFT HAND THREAD. HOLD ACTUATOR PISTON SHAFT HEX WHILE LOOSENING SHOULDER BOLT.

CAUTION : MAKE CERTAIN THE CRIMPED LOCKING CUP AND RETAINING NUT DO NOT LOOSEN FROM THE PISTON SHAFT WHEN THE SHOULDER BOLT IS REMOVED.

(9)Remove cotter pin (5), securing shoulder bolt (3) to bleed valve rod end clevis and remove shoulder bolt (left hand thread).

(10)Remove bolts (6) and washers (9) securing actuator (2) to intermediate case.

CAUTION : MAKE CERTAIN THE CRIMPED LOCKING CUP AND RETAINING NUT DO NOT LOOSEN FROM THE PISTON SHAFT WHEN THE PISTON SHAFT HEX IS ROTATED. IF THE RETAINING NUT CHANGES OR LOOSENS, THE INTERNAL ADJUSTMENT OF THE ACTUATOR CAN BE AFFECTED AND ACTUATOR OR ENGINE DAMAGE CAN OCCUR.

(11)Remove actuator by rotating actuator piston shaft hex counterclockwise to disengage internal threads securing piston shaft to rod end clevis.

(12)If new actuator is to be installed, remove adapters from ports and discard packings.

(13)Install protective closures.

C. Installation (Ref. Fig. 401)

(1)Remove protective closures.

(2)If actuator has been replaced or repaired and adapters were removed comply with the following :

(a)Remove protective closures and install packings, lubricated with Material No.P03-001 to adapters (7) and (8).
Install adapters, threads lubricated with Material No.P03-001, to ports in actuator (2) and TORQUE adapter (7) to between 150 and 170 lbf.in. (1.69 and 1.92 m.daN) and adapter (8) to between 100 and 120 lbf.in. (1.24 and 1.35 m.daN).

CAUTION : DO NOT ROTATE BLEED VALVE ROD END CLEVIS (1). ROTATING CLEVIS MAY CAUSE DAMAGE TO BLEED VALVE LINKAGE.

R (3)Lubricate the external threads of rod end clevis as follows :

R (a)(For Engines Without SB PW4ENG 75-154) Lubricate the external (OD) threads of the rod end clevis (1) with Material No. P03-001.
R (b)(For Engines With SB PW4ENG 75-154) Lubricate the external threads of the rod end clevis (1) with Material No. P06-054. Apply the paste to the entire area of the external threads and to a maximum of 0.250 in. (6.350 mm) more than both ends of the threads.
R CAUTION : DO NOT ROTATE BLEED VALVE ROD END CLEVIS (1). ROTATING CLEVIS MAY CAUSE DAMAGE TO BLEED VALVE LINKAGE.
R (4)Slide the hollow piston shaft (11) of the actuator (2) over the lubricated rod end clevis (1). Rotate piston shaft hex clockwise to engage OD threads of rod end clevis with ID threads of piston shaft. Continue rotating until actuator is mated with intermediate case (10).
CAUTION : WITH THE PWA85928 TORQUE ADAPTER, ADJUST THE ACTUAL TORQUE WRENCH READING (REF. 70-00-00, P. BLOCK 201). TOO MUCH TORQUE CAN DAMAGE THE THREADED PARTS.
R (5)Secure actuator (2) to intermediate case (10) using bolts (6), threads lubricated with Material No.P03-001, and washers (9). Use the PWA85928 Torque Adapter and TORQUE bolts to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN).
R (6)For engines with the 2.5 bleed actuator support bracket (POST SB PW4ENG 75-84) do the following.
(a)Install the support bracket to the actuator with bolts, threads lubricated with Engine Oil (Material No.P03-001). Tighten the bolts by hand.

Pre SB PW4ENG 75-126

(b)Align the three boltholes in the support bracket with the three boltholes in the bracket on Flange E. Attach the two brackets together with nuts and bolts, threads lubricated with Engine Oil (Material No.P03-001). Tighten the nuts by hand.

Post SB PW4ENG 75-126

(c)Align the three boltholes in the support bracket with the three boltholes in the bracket on Flange E. Attach the two brackets with bolts, threads lubricated with Engine Oil (Material No.P03-001) and installed in the nutplates.

End of SB PW4ENG 75-126

(d)TORQUE the bolts that attach the support bracket to the actuator to between 65 and 85 lbf.in. (0.73 and 0.96 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the bolts.
(e)TORQUE the bolts that attach the support bracket to bracket on Flange E to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
R (7)Connect W3P15 harness connector to actuator.
CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.
(a)Align connector keyway and push harness connector into mating

receptacle. While pushing inward on connector, tighten coupling ring handtight. Connector is properly secured when color band closest to threads is fully covered by coupling ring.

(b) Secure harness to outer faces of two legs on bracket attached to HPC case with clamps, bolts, threads lubricated with Material No.P03-001, and nuts. Position bolts heads down. TORQUE nuts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

R (8) Install bolt, washer, and nut into clamp assembly and loosely position drain tube assembly in place.

R (9) Tighten coupling nut on aft end of drain tube assembly. TORQUE coupling nut to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

R (10) Install new packing and union in 2.5 bleed valve actuator drain port. TORQUE union to between 125 and 140 lbf.in. (1.41 and 1.58 m.daN).

R (11) Tighten forward end of drain tube assembly to union at 2.5 bleed valve actuator. TORQUE coupling nut to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

R (12) Tighten coupling nut of connecting tube. TORQUE coupling nut to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

R (13) Tighten nut on clamp assembly.

D. Close-Up and Test

(1) Install the fan exit liner segment (inner rear) that you removed (Ref. 72-23-05, P. Block 401).

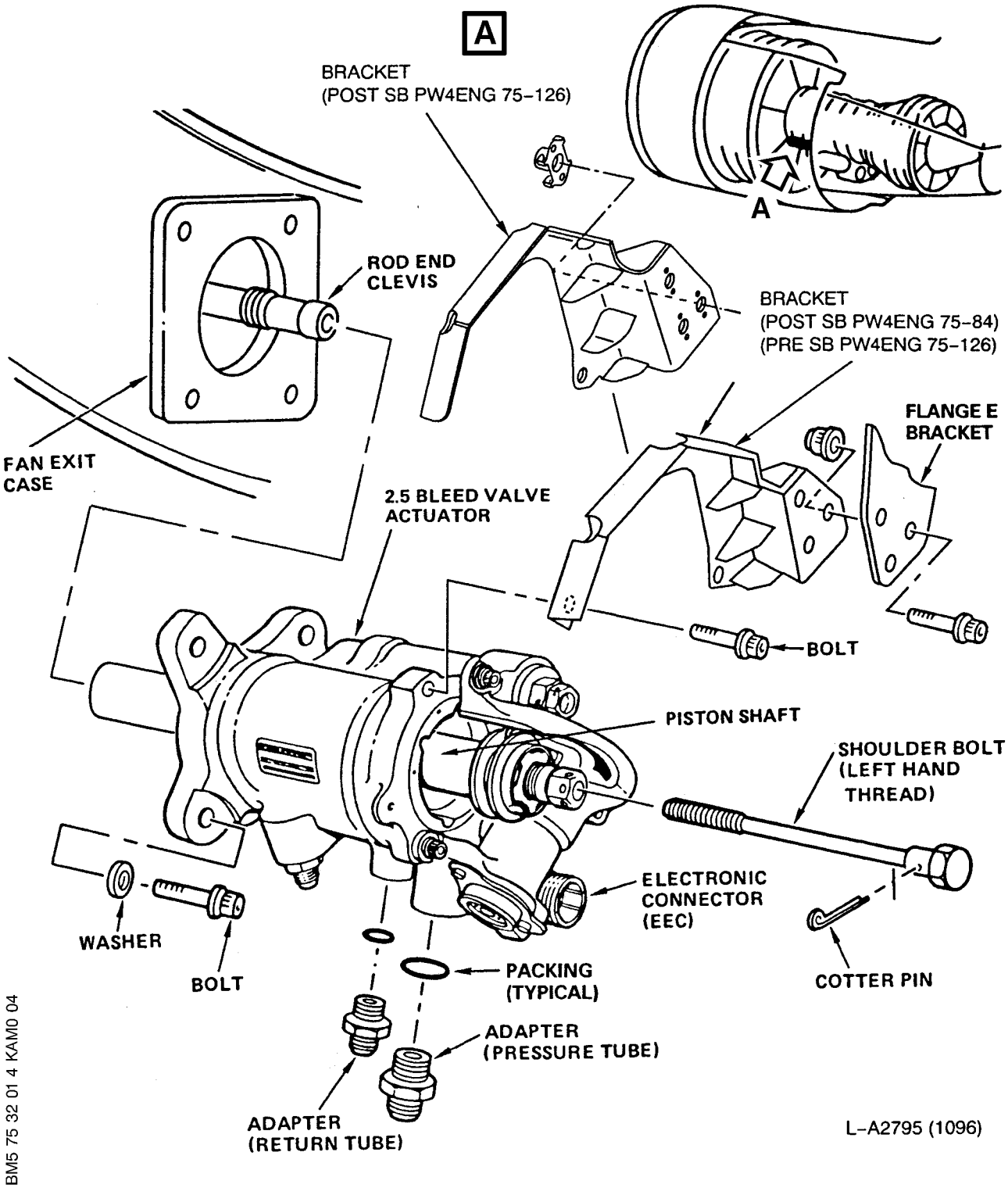
(2) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(3) Rig actuator (Ref. 75-32-01, P. Block 501).

(4) On the appropriate FIRE control module, push the fire handle and remove the warning notice.

(5) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(6) Remove safety clips and tags and close circuit breakers : 19KS, 21KS, 18KS, 20KS.



Replacement of (2.5) Bleed Valve Actuator
Figure 401

2.5 BLEED VALVE ACTUATOR - ADJUSTMENT/TEST

1. Rig 2.5 Bleed Valve Actuator

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)Material No.P03-001	Oils (Ref. 70-00-00)
(3)Material No.P05-038	Special Materials (Ref. 70-00-00)
(4)Material No.P05-289	Special Materials (Ref. 70-00-00)
(5)Material No.P05-291	Special Materials (Ref. 70-00-00)
(6)Material No.P05-292	Special Materials (Ref. 70-00-00)
(7)Material No.P06-003	Lubricants (Ref. 70-00-00)
(8)Material No.P09-014	Sealants (Ref. 70-00-00)
(9)	Cotter Pin
10)	Torque Wrench
11)	Container Approximately 1/2 Pint (1/4 liter)
12)	Bergen Mechanical Crimper (Optional), Model M303, M305 or M307
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

B. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 501, 502)

CAUTION : TO AVOID SHOULDER BOLT (6) DAMAGE, BE AWARE THAT SHOULDER BOLT IS LEFT HAND THREAD. HOLD ACTUATOR PISTON SHAFT HEX (3) WHILE LOOSENING SHOULDER BOLT.

CAUTION : MAKE SURE THE CRIMPED LOCKING CUP AND RETAINING NUT DO NOT LOOSEN FROM THE PISTON SHAFT WHEN THE SHOULDER BOLT IS REMOVED.

(1)If not previously accomplished, remove cotter pin (7) from shoulder bolt (6) on actuator piston shaft (3) and while holding piston shaft, remove shoulder bolt.

CAUTION : MAKE SURE THE CRIMPED LOCKING CUP AND RETAINING NUT DO NOT LOOSEN FROM THE PISTON SHAFT WHEN THE PISTON SHAFT HEX IS ROTATED. IF THE RETAINING NUT CHANGES OR LOOSENS, THE INTERNAL ADJUSTMENT OF THE ACTUATOR CAN BE AFFECTED AND ACTUATOR OR ENGINE DAMAGE CAN OCCUR.

(2)Install a speed handle and socket on the hex end of the piston shaft (3). Rotate the piston shaft clockwise (as viewed from the rear) until the shaft rotation stops.

(3)Rotate the piston shaft counterclockwise (as viewed from the rear) four turns.

CAUTION : TO AVOID SHOULDER BOLT (6) DAMAGE, BE AWARE THAT SHOULDER

BOLT IS LEFT HAND THREAD.
HOLD ACTUATOR PISTON SHAFT HEX WHILE TORQUING SHOULDER BOLT.

(4)Holding piston shaft hex (3) to prevent rotation, install shoulder bolt (6), threads lubricated with Engine Oil (Material No.P03-001) to piston shaft.
TORQUE shoulder bolt to between 50 and 70 lbf.in. (0.56 and 0.79 m.daN).

(5)Install cotter pin (7) to secure shoulder bolt.
NOTE : Shoulder bolt may be rotated 30 degrees maximum in either direction to install cotter pin.
This can cause, acceptable torque, not in the torque range given in step 2.B. (4).

(6)If necessary, install bleed valve actuator pressure (CP06) and return (CR02) tubes.
(a)Remove protective closures.
(b)Lubricate return tube (CR02) nut threads with Engine Oil (Material No.P03-001) and connect to manifold (CR04) tee and to actuator.
(c)Lubricate pressure tube (CP06) nut threads with Antigalling Compound (Material No.P06-003) and connect tube to manifold (CP05) tee and or to actuator.
(d)For Post SB PW4 ENG 75-45 engines, install clamps, bolt, lubricated with Engine Oil (Material No.P03-001), and nut, that attach the tubes together.
TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(e)TORQUE pressure tube (CP06) nut at manifold (CP05) tee to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.
(f)TORQUE pressure tube (CP06) nut at actuator to between 225 and 250 lbf.in. (2.54 and 2.82 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.
(g)TORQUE return tube (CR02) nuts to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN). Install the Lockwire (Material No.P05-289) or the Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nuts.

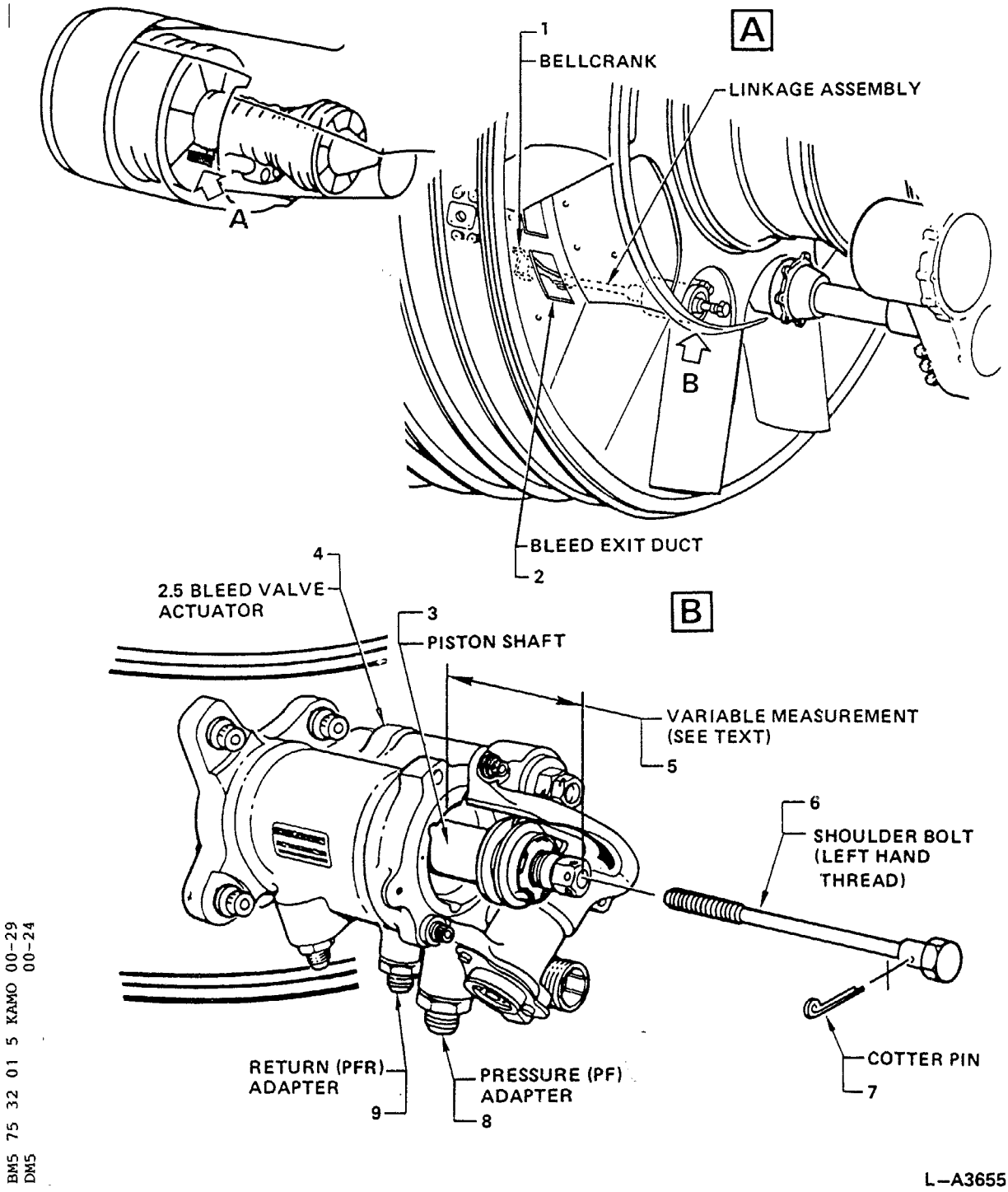
(7)Clean shoulder bolt cotter pin area at both ends with clean Cheesecloth (Material No.P05-038) dampened with Solvent (Material No.P11-005). Surfaces shaOl be thoroughly dried in ambient temperatures. Drying time shall be sufficient to remove traces of solvent detrimental to sealant. Apply Sealant (Material No.P09-014) to both ends of cotter pin.

D. Close-Up

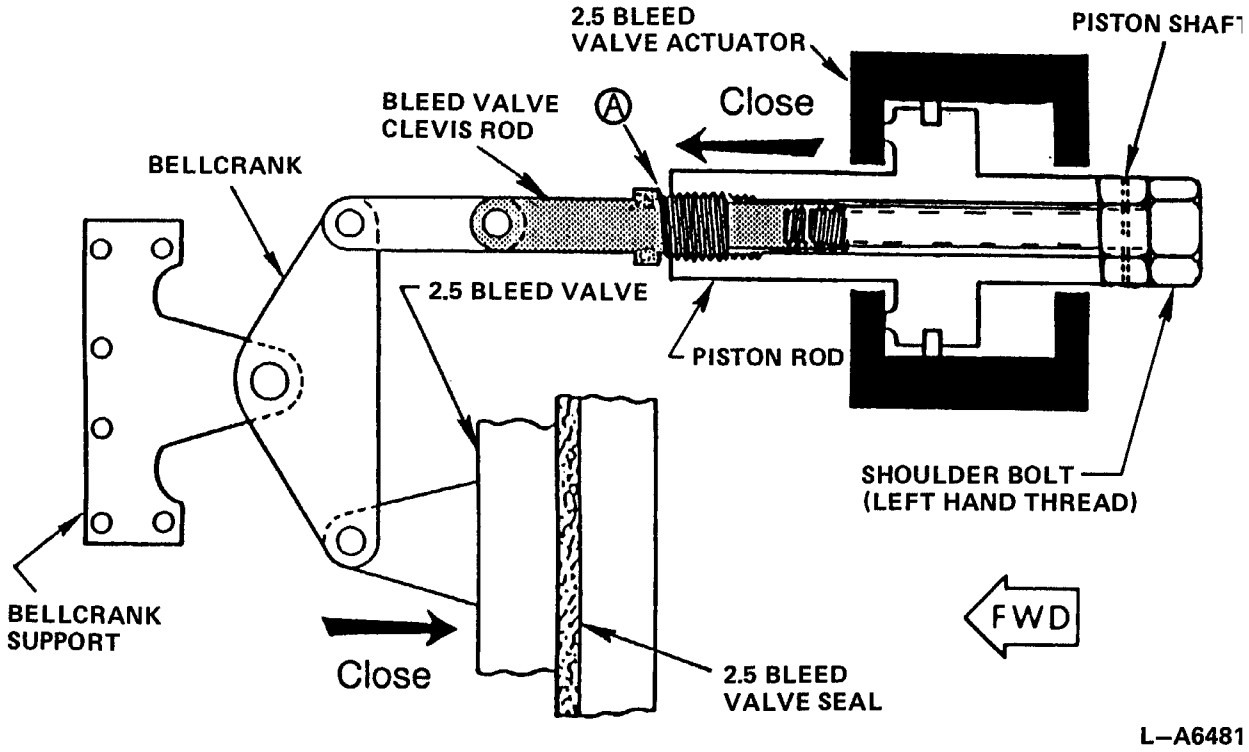
(1)If necessary, install the fan exit liner segment (inner rear) that you removed (Ref. 72-23-05, P. Block 401).

(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(3)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



2.5 Bleed Valve Actuator (sheet 1/2)
Figure 501



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2.5 Bleed Valve Actuator (sheet 2/2)
Figure 502

(4)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

2. Rig 2.5 Bleed Valve Actuator (Alternate Procedure Using Hydraulic Pressure)

A. General

(1)Use this procedure to adjust the 2.5 bleed valve actuator to the necessary limits. This procedure uses hydraulic pressure for the operation of the actuator during the adjustment.

B. Equipment and Materials

ITEM	DESIGNATION
(1)	Glenair (Electrical Connector) Soft Jawed Pliers - TG-69
(2)	Glenair (Electrical Connector) Strap Wrench - TG-70
(3)	Torque Wrench
(4)	Depth Micrometer 0 - 6 Inches
(5)	Bergen Mechanical Crimper (Optional), Model M303, M305 or M307
R (6)PWA29451	Pump Adapter
(7)PWA49030	Hydraulic Pump (Optional to CTE5100)
(8)CTE5100	Hydraulic Pump (Optional to PWA49030)
(9)PWA85842	Electrical Control Box
10)PWA101618	Pump Adapter (Elbow) (2 necessary)
11)Material No.P03-001	Oils (Ref. 70-00-00)
12)Material No.P03-003	Oils (Ref. 70-00-00)
13)Material No.P05-038	Special Materials (Ref. 70-00-00)
14)Material No.P05-289	Special Materials (Ref. 70-00-00)
15)Material No.P05-291	Special Materials (Ref. 70-00-00)
16)Material No.P05-292	Special Materials (Ref. 70-00-00)
17)Material No.P06-021	Lubricants (Ref. 70-00-00)
18)Material No.P09-014	Sealants (Ref. 70-00-00)
19)Material No.P11-014A	Cleaning Agents (Ref. 70-00-00)
20)	Cotter Pin
Referenced Procedures	
- 72-23-05, P. Block 401	Fan Exit Liner Segments
- 75-32-01, P. Block 201	Actuator - 2.5 Bleed Valve

NOTE : Make sure the correct adapters are with the Hydraulic Pump. You can use the PWA101618 Adapter Elbows or the equivalent No. 6 standard elbows. The elbows are necessary to connect the hoses to the adapters on the actuator.

C. Prepare for the Adjustment (Ref. Fig. 503)

NOTE : Do the following steps only if not previously done during the removal of the old 2.5 bleed actuator.

(1)Remove the fan exit liner segment (inner) which covers the actuator (Ref. 72-23-05, P. Block 401).

(2)Use the TG-69 Glenair Soft Jawed Pliers or the TG-70 Glenair Strap Wrench

to disconnect the electrical connector (W3P15) from the actuator. (Ref. Fig. 503)

(3)Put a fluid drain collector/container under the actuator.

(4)Remove pressure from the hydraulic tubes as follows :

(a)Remove lockwire or safety cable from the tube nuts at both ends of each tube (CP06) and (CR02).

(b)While you hold the tee with a wrench, disconnect the hydraulic pressure tube (CP06) at the (CP02) tee to remove any pressure.

(c)While you hold the tee with a wrench, disconnect the hydraulic return tube (CR02) at the (CR04) tee to remove any pressure.

(5)Remove the bleed valve actuator hydraulic pressure tube (CP06) and return tube (CR02) as follows :

(a)Hold the adapters with a wrench and disconnect the tube nuts from the actuator.

NOTE : It is not necessary to disconnect the drain manifold (DR11) from the actuator.

(6)Connect the hoses from the PWA49030 or CTE5100 Hydraulic Pump as follows :

NOTE : If you do not know which Pump hoses to use, see the instructions for hydraulic pump service and operation (Ref. 75-32-01, P. Block 201).

(a)Install the PWA29451 Pump Adapter to the actuator rear adapter.

(b)While you hold the rear adapter with a wrench, tighten the Pump Adapter.

(c)Connect the two elbows to the two pump hoses (pressure and return).

(d)Tighten the hoses to the elbows.

(e)Connect the return hose elbow to the forward adapter.

(f)While you hold the forward adapter with a wrench, tighten the elbow.

(g)Connect the pressure hose elbow to the Pump Adapter.

(h)While you hold the Pump Adapter with a wrench, tighten the elbow.

(7)With the power OFF, connect the PWA85842 Electrical Control Box Connector to the actuator receptacle.

(8)Remove the shoulder bolt (1) from the actuator piston shaft as follows :

(a)Remove and discard the cotter pin (2) installed to the piston shaft and bolt (1).

CAUTION : BE CAREFUL WHEN YOU LOOSEN THE SHOULDER BOLT BECAUSE THE SHOULDER BOLT HAS A LEFT-HAND THREAD. IF YOU DO NOT DO THIS, YOU CAN DAMAGE THE SHOULDER BOLT.

CAUTION : MAKE SURE THAT YOU HOLD THE HEX PORTION OF THE ACTUATOR PISTON SHAFT WITH A WRENCH WHEN YOU LOOSEN THE SHOULDER BOLT. IF YOU DO NOT DO THIS, YOU CAN DAMAGE THE SHOULDER BOLT.

CAUTION : MAKE SURE THAT THE CRIMPED LOCKING CUP AND RETAINING NUT DO NOT LOOSEN FROM THE PISTON SHAFT WHEN THE SHOULDER BOLT IS REMOVED. IF THE RETAINING NUT CHANGES OR LOOSENS, THE INTERNAL ADJUSTMENT OF THE ACTUATOR CAN BE AFFECTED AND ACTUATOR OR ENGINE DAMAGE CAN OCCUR.

(b)Hold the piston shaft hex with a wrench and remove the shoulder bolt (1) (LEFT-HAND THREAD).

(9)Turn the piston shaft hex clockwise (from rear) only until the shaft stops.

(a)Do not use too much force. This will tighten the piston shaft against

the bleed valve clevis rod until bottomed.

D. Procedure (Ref. Fig. 504)

(1)Equipment Check

WARNING : MAKE SURE ALL PERSONS AND TOOLS ARE AWAY FROM THE MECHANICAL PARTS OF THE BLEED SYSTEM. WHEN YOU START THE PUMP, THE ACTUATOR CAN MOVE. IF YOU DO NOT DO THIS, YOU CAN CAUSE INJURY OR DAMAGE TO THE ENGINE.

(a)Service the pump with the Calibrating Fluid (Material No.P03-003) and connect to a power source.

NOTE : If you do not know how to service and operate the hydraulic pump, see the instructions for hydraulic pump service and operation (Ref. 75-32-01, P. Block 201).

(b)Supply 100 psig to the actuator aft pressure adapter.

(c)Set the POWER switch on the PWA85842 Electrical Control Box to the ON position.

(d)Use the Electrical Box to cycle the bleed valve back and forth between open and closed positions to make sure the 2.5 bleed valve assembly moves freely.

(e)After cycling the bleed valve, leave the bleed valve in the closed (actuator piston shaft forward) position.

(f)All actuation of the bleed system to the valve open or valve closed positions should now be done using the PWA85842 Electrical Control Box OPEN/CLOSE switch.

(g)Keep 100 psig pressure to the actuator during all measurements.

(2)Piston Travel Check

NOTE : All measurements must be made with 100 psig at the actuator with a depth micrometer and from the piston shaft to the same location on the housing.

(a)Measure the length of piston travel as follows :

1 Establish a stationary reference point on the actuator housing to be used for all piston travel measurements which follow.

2 Make sure the bleed valve is in the closed (actuator piston shaft forward) position.

3 Measure the distance from the piston shaft end to the reference point on the actuator housing.

4 Record as Dimension No. 1.

5 Actuate the bleed system to the valve open (actuator piston shaft rearward) position.

6 Measure the distance from the piston shaft end to the reference point on the actuator housing.

7 Record as Dimension No. 2.

8 Determine piston travel by subtracting Dimension No. 1 from Dimension No. 2.

9 Record the result as Dimension No. 3.

10 Piston travel should be between 2.280 and 2.320 in. (57.91 and 58.93 mm).

(b)If the piston travel is not within limits, repeat the measurement.

(c)If the piston travel is still not within limits, check to make sure the piston shaft is fully against the bleed valve clevis rod as follows:

1 Remove pressure to the actuator.

2 Turn the piston shaft hex clockwise (from rear) only until the shaft stops.
3 Do not use too much force.
4 This will tighten the piston shaft against the bleed valve clevis rod until bottomed.

(d)Supply 100 psig to the actuator and do the piston travel check again.
1 If the piston travel is still not within the limits, replace the actuator.

(3)Set Bleed Valve Compression

(a)Make the initial bleed valve compression adjustment as follows:
1 Remove the pressure from the actuator (0 psig).
2 Turn the piston shaft one turn counterclockwise.
3 Supply 100 psig pressure to the actuator again.
4 Actuate the bleed system to the valve closed (actuator piston shaft forward) position.
5 Measure the adjusted dimension between the piston shaft end and the established reference point on the actuator housing.
6 Record the result as Dimension No. 4.
7 Dimension No. 4 should be 0.015 in. (0.381 mm) minimum greater than Dimension No. 1.

(b)If Dimension No. 4 is not within the limits, do as follows:
1 Actuate the bleed system to the valve open (actuator piston shaft rearward) position.
2 Remove pressure to the actuator.
3 Turn the piston one more full turn counterclockwise.
4 Supply 100 psig pressure to the actuator again.
5 Actuate the bleed system again to the valve closed (actuator piston shaft forward) position.
6 Measure the adjusted dimension again between the piston shaft end and the established housing reference point.
7 The adjusted Dimension No. 4 should be 0.015 in. (0.381 mm) minimum greater than Dimension No. 1.
8 If Dimension No. 4 is still not within the limits, do this step again only enough times until Dimension No. 4 is within the limits.

(c)Make the final compression adjustment as follows :
1 Actuate the bleed system to the valve open (actuator piston shaft rearward) position.
2 Remove pressure to the actuator.
3 Turn the piston shaft 1/4 turn (90 degrees) clockwise.
4 Supply 100 psig pressure to the actuator again.
5 Actuate the bleed system again to the valve closed (actuator piston shaft forward) position.
6 Measure the dimension between the end of the piston shaft to the established reference point on the actuator housing.
7 Record this measurement as Dimension No. 5.
8 Compare Dimension No. 5 with Dimension No. 1.
9 Dimension No. 5 should be within 0.005 in. (0.127 mm) of Dimension No. 1.

(d)If Dimension No. 5 is not within 0.005 in. (0.127 mm) of Dimension No. 1, do as follows :
1 Actuate the bleed system to the valve open (actuator piston shaft

rearward) position.
2 Remove pressure to the actuator.
3 Turn the piston another 1/4 turn (90 degrees) clockwise.
4 Supply 100 psig pressure to the actuator again.
5 Actuate the bleed system again to the valve closed (actuator piston shaft forward) position.
6 Measure Dimension No. 5 again.
7 Dimension No. 5 should be within 0.005 in. (0.127 mm) of Dimension No. 1.
8 If Dimension No. 5 is still not within the limits, do this step again only enough times until Dimension No. 5 is within the limits.

(e)Cycle the bleed valve between the open and closed positions to verify that the 2.5 bleed valve assembly can be moved freely.
(f)Remove pressure to the actuator.
(g)Remove power from the pump.
(h)Set the POWER switch on PWA85842 electrical control box to the OFF position.

(4)Shoulder Bolt Installation
(Ref. Fig. 503) (Sheet 1/3)
(a)Install the (LEFT-HAND THREAD) shoulder bolt (1) to the piston shaft as follows :
1 Apply Engine Oil (Material No.P03-001) to the threads on the shoulder bolt (1).
CAUTION : TO PREVENT LOSS OF ADJUSTMENT OR DAMAGE TO THE SHOULDER BOLT, MAKE SURE YOU HOLD THE ACTUATOR PISTON SHAFT HEX NUT WHEN YOU TORQUE THE SHOULDER BOLT.
2 Hold the piston shaft hex with a wrench and tighten the shoulder bolt (1) (LEFT-HAND THREAD).
3 TORQUE the shoulder bolt (1) (LEFT-HAND THREAD) to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN).
4 Remove any contamination (oil, fuel, grease, dirt) from the end of the piston shaft where you must install the cotter pin (2) and sealant.
5 Install the new cotter pin (2) to the piston shaft and shoulder bolt (1).
NOTE : You can turn the shoulder bolt 30 degrees maximum in either direction to install the cotter pin. This adjustment for the cotter pin will keep the torque on the shoulder bolt satisfactory.
6 Apply Silicone Rubber Sealant (Material No.P09-014) to both ends of the cotter pin (2).

(5)Remove the Adjustment Equipment
(Ref. Fig. 503) (Sheets 2/3 and 3/3)
(a)Disconnect Electrical Control Box connector from the actuator receptacle.
CAUTION : CONNECT THE ENGINE ELECTRICAL CONNECTOR AS SOON AS POSSIBLE. IF YOU DO NOT, CONTAMINATION OF THE CONNECTION CAN OCCUR.
CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION. IF YOU DO NOT, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR CAN AFFECT ENGINE OPERATION, LIGHTNING PROTECTION, AND CAUSE AN IN FLIGHT

SHUTDOWN.

(b)Connect the self-locking electrical connector (W3P15) to the actuator receptacle as follows :

1 Examine, align, and install the connector.
2 Use the Glenair TG-69 Soft Jawed Pliers or the Glenair TG-70 Strap Wrench and tighten the connector against the receptacle.
3 While you tighten, push the connector in and from side to side.
4 Make sure you can feel the ratchet feature.
5 Tighten the connector until the pliers or strap wrench slip on the connector ring.

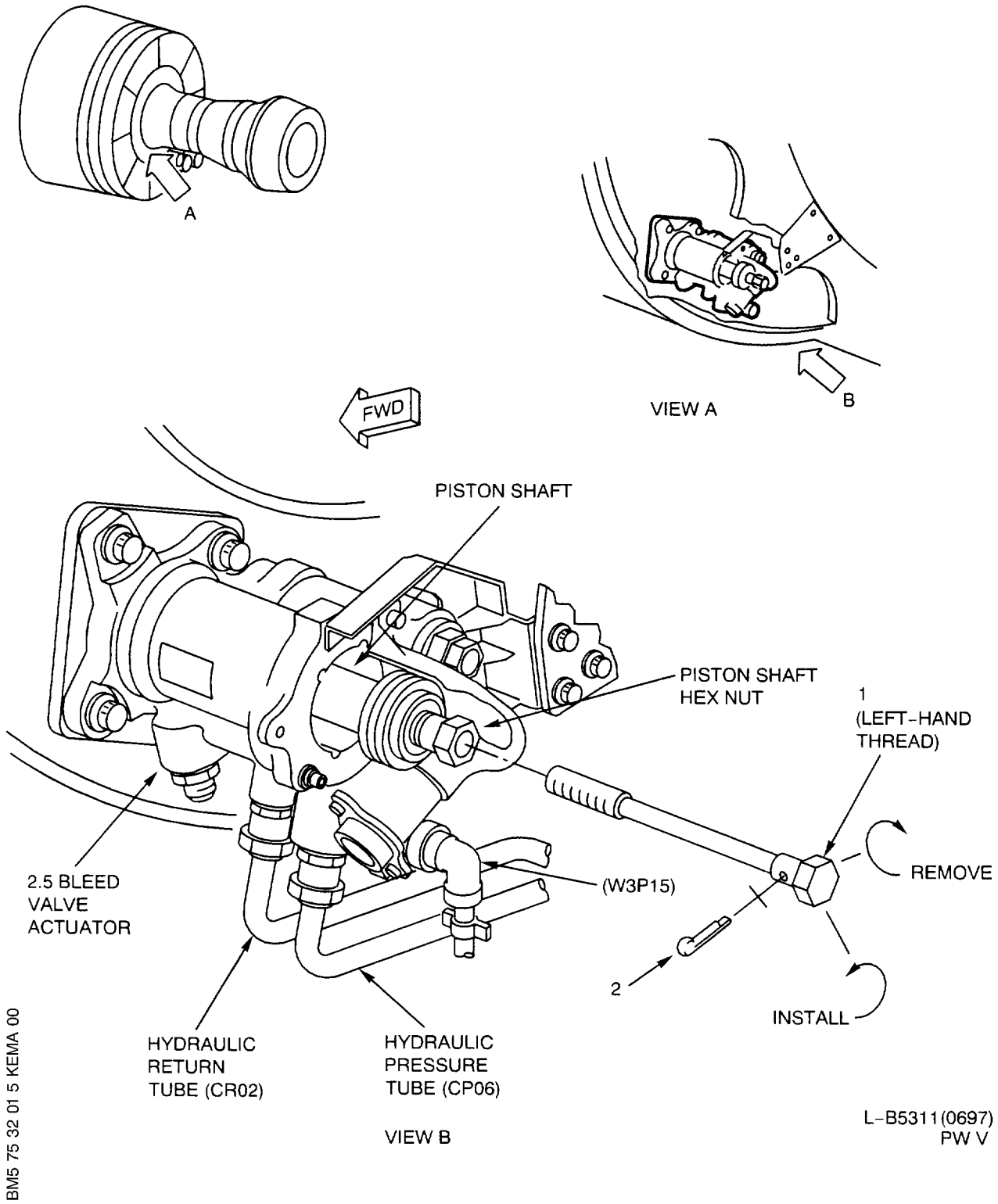
(c)While you hold the adapters with a wrench, disconnect the two hose elbows from the actuator.

(d)While you hold the adapter with a wrench, remove the PWA29451 Pump Adapter from the aft actuator adapter.

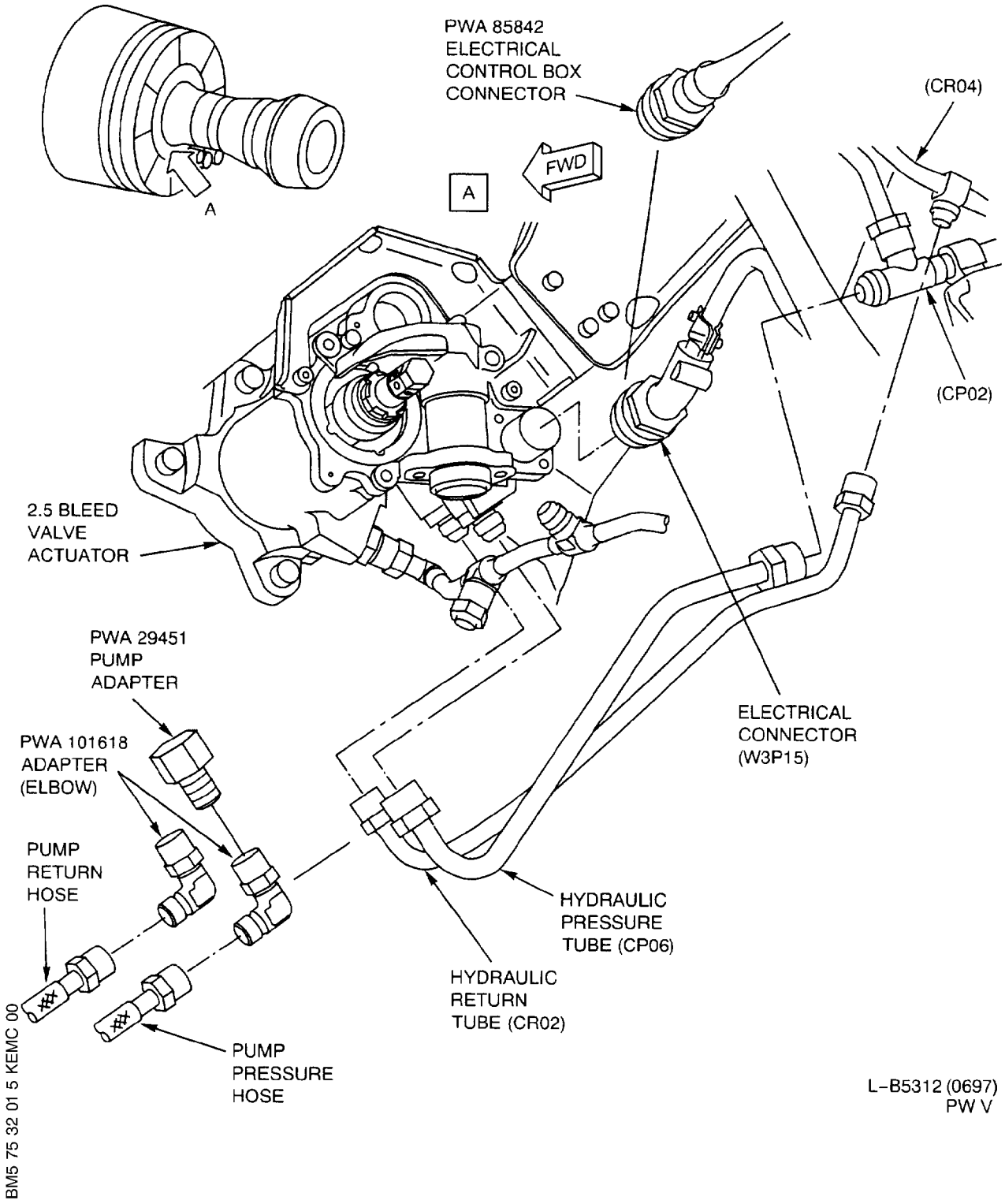
(e)Install the hydraulic pressure tube (CP06) (16) and the hydraulic return tube (CR02) (17) as follows :

1 Apply Antigalling Compound (Material No.P06-021) to the nut threads and the backs of the ferrules on both tubes.
2 Connect the hydraulic return tube (CR02) to the forward adapter on the actuator and the (CR04) tee.
3 While you hold the adapter and tee with a wrench, TORQUE the (CR02) tube nuts at each end to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).
4 Connect the hydraulic pressure tube (CP06) to the aft adapter on the actuator and to the (CP02) tee.
5 While you hold the adapter and tee with a wrench, TORQUE the (CP06) tube nuts at each end to between 225 and 250 lbf.in. (2.55 and 2.82 m.daN).
6 Safety the nuts on both tubes at both ends with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

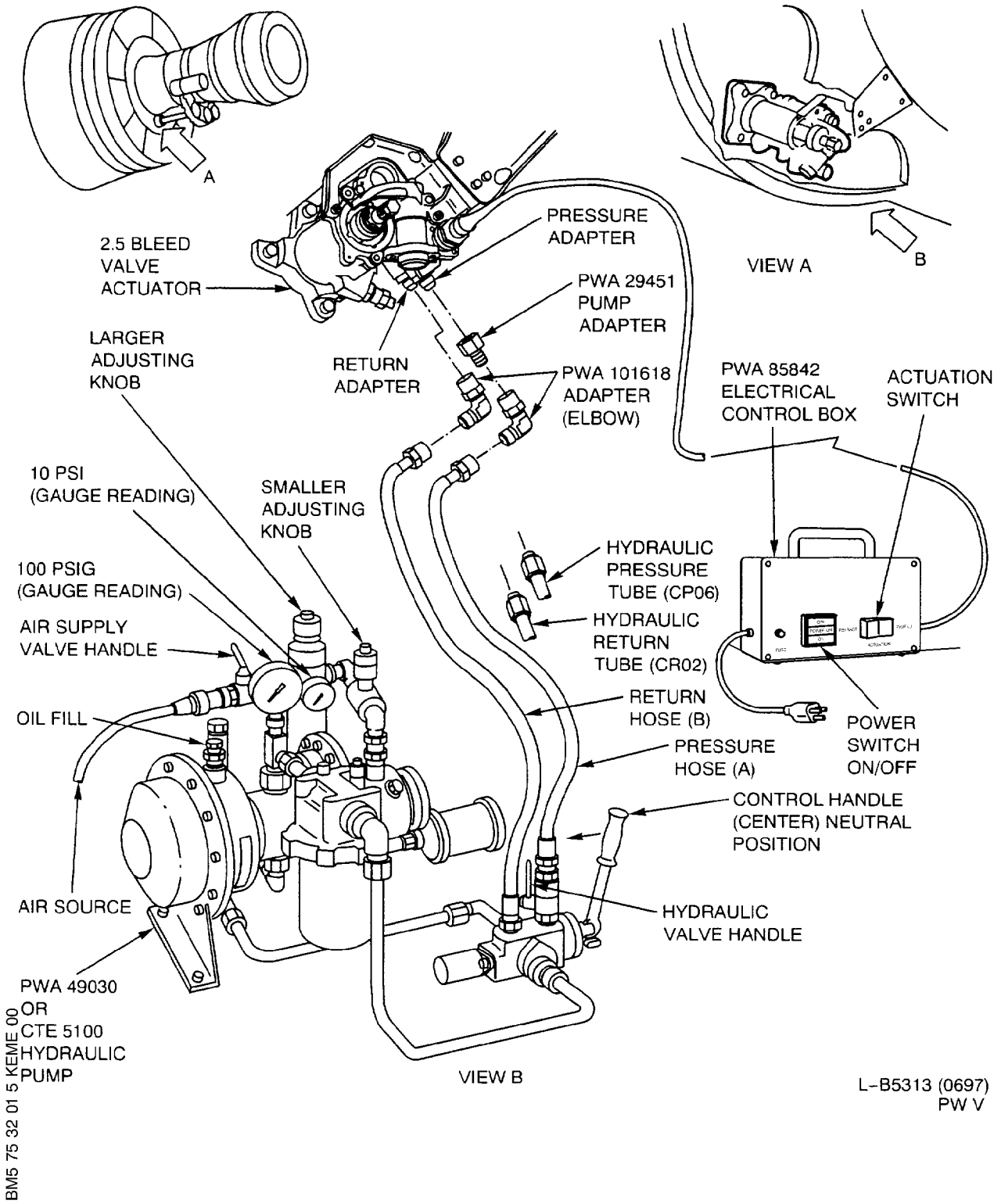
(f)Install the fan exit liner segment (inner) (Ref. 72-23-05, P. Block 401).



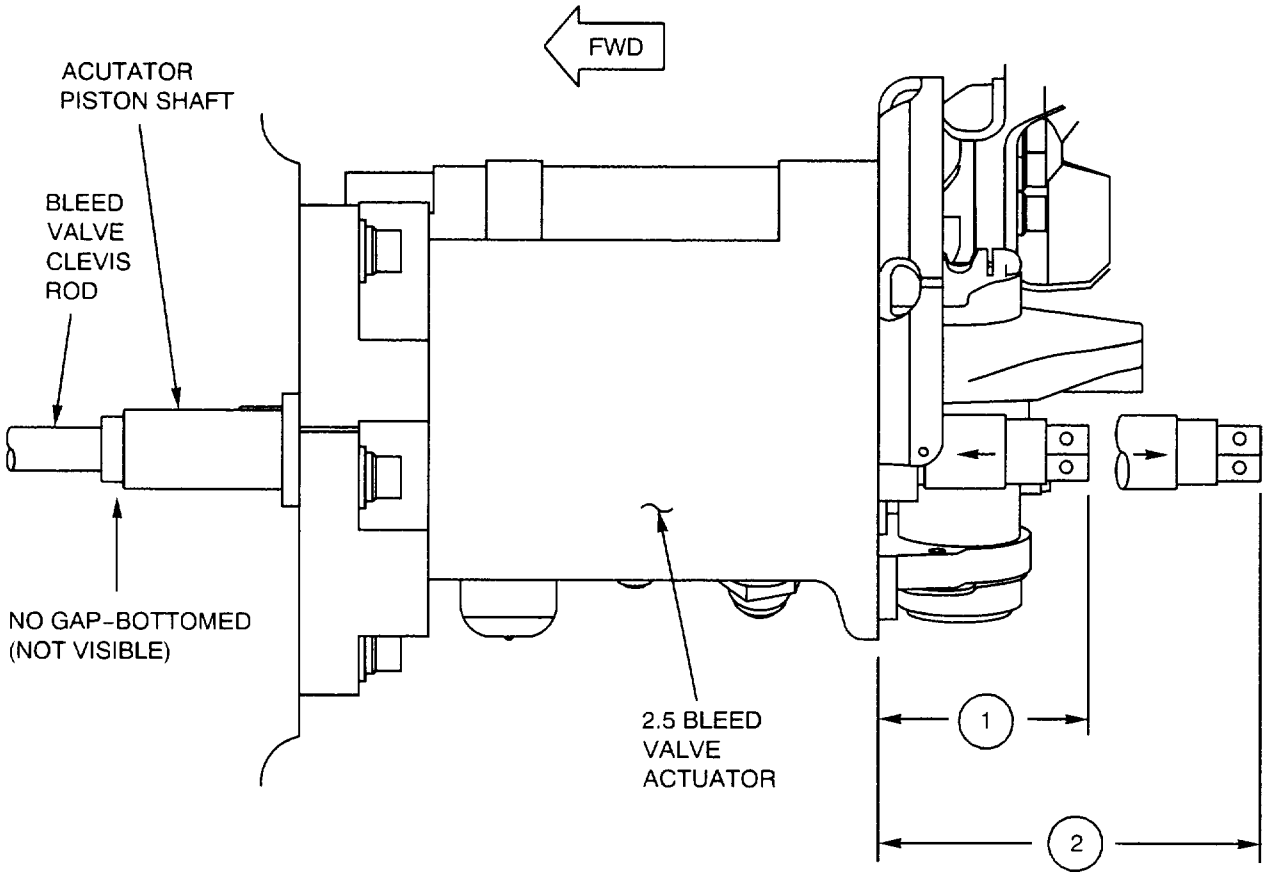
Adjustment of the 2.5 Bleed Valve Actuator (Sheet 1/3)
Figure 503



Adjustment of the 2.5 Bleed Valve Actuator (Sheet 2/3)
Figure 503



Adjustment of the 2.5 Bleed Valve Actuator
(Piston Travel Check) (Sheet 3/3)
Figure 503



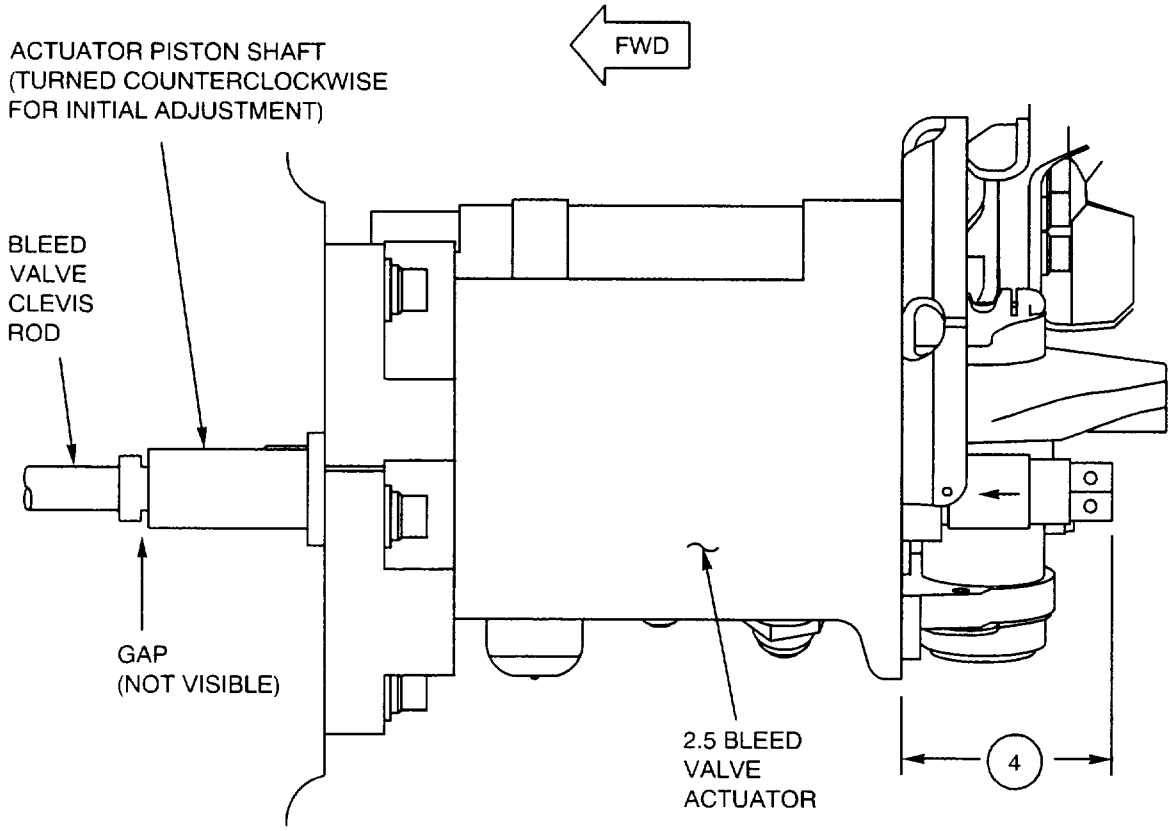
PISTON TRAVEL CHECK

PISTON REARWARD.....DIMENSION ②
PISTON FORWARD.....DIMENSION ①
SUBTRACT -
PISTON TRAVEL.....DIMENSION ③

BM5 75 32 01 5 KGMA 00

L-B5314 (0697)
PW V

Adjustment of the 2.5 Bleed Valve Actuator
(Initial Compression Adjustment) (Sheet 1/4)
Figure 504



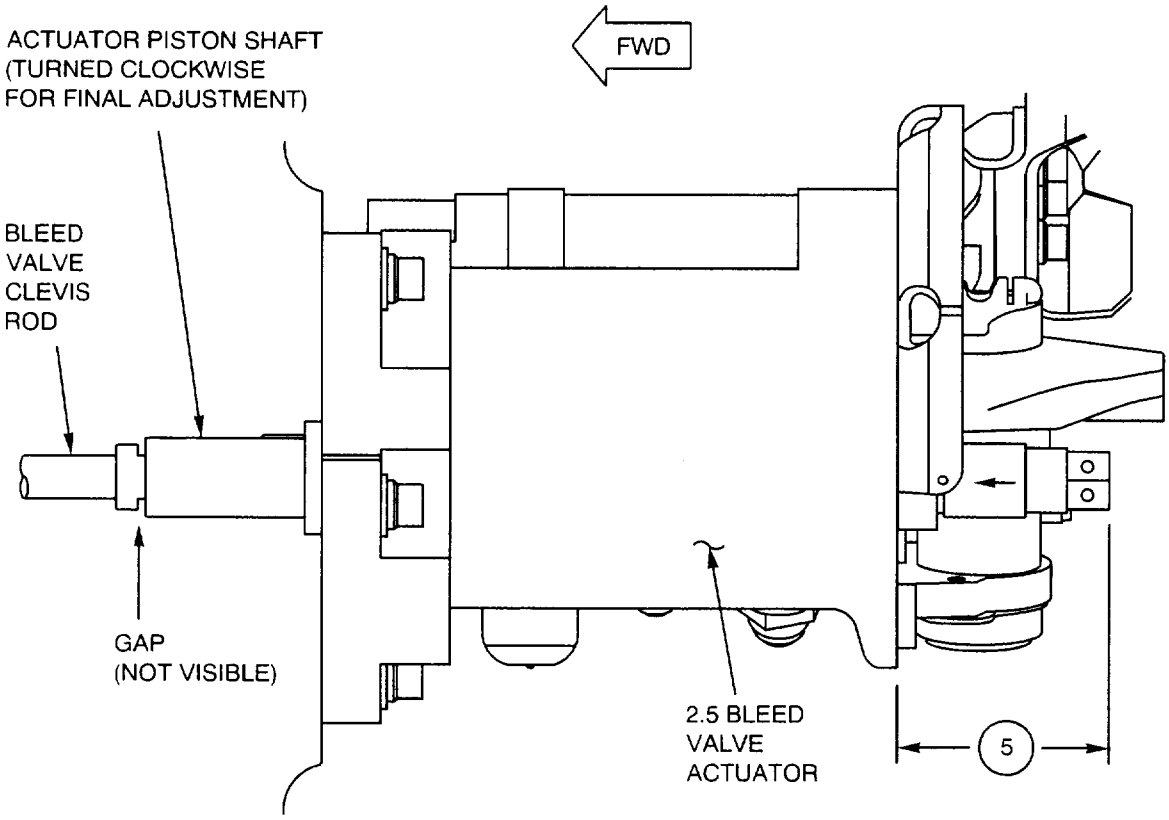
INITIAL COMPRESSION ADJUSTMENT

NUMBER OF TURNS COUNTERCLOCKWISE FROM BOTTOMED _____
PISTON FORWARD
(AFTER INITIAL ADJUSTMENT).....DIMENSION (4) _____
DIMENSION (1) _____
SUBTRACT - _____
INITIAL DIFFERENCE _____

L-B5315 (0697)
PW V

BM5 75 32 01 5 KGMC 00

Adjustment of the 2.5 Bleed Valve Actuator
(Final Compression Adjustment) (Sheet 2/4)
Figure 504



FINAL COMPRESSION ADJUSTMENT

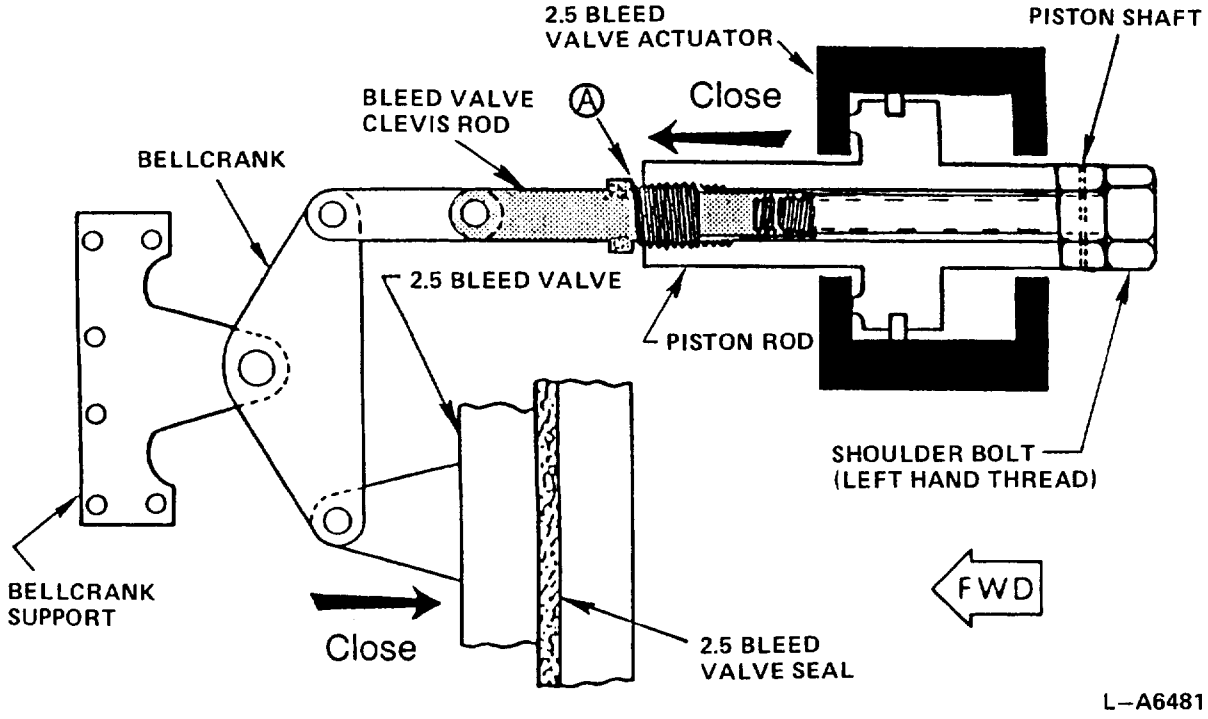
NUMBER OF TURNS CLOCKWISE FROM INITIAL ADJUSTMENT _____
PISTON FORWARD
(AFTER FINAL ADJUSTMENT).....DIMENSION ⑤ _____
DIMENSION ① _____
SUBTRACT - _____
FINAL DIFFERENCE _____

(NOTE: IF DEMENSION ① IS MORE THAN DIMENSION ⑤, SUBTRACT DIMENSION ⑤ FROM DIMENSION ① TO DETERMINE THE DIFFERENCE.)

L-B5316 (0697)
PW V

BM5 75 32 01 5 KGME 00

Adjustment of the 2.5 Bleed Valve Actuator
(Cross Section Schematic) (Sheet 3/4)
Figure 504



BM5 75 32 01 5 KGMG 00

Adjustment of the 2.5 Bleed Valve Actuator
(Cross Section Schematic) (Sheet 4/4)
Figure 504

HPC SECONDARY FLOW CONTROL SYSTEM - DESCRIPTION AND OPERATION

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

1. General (Ref. Fig. 001, 002)
The HPC secondary flow control system is designed to reduce engine fuel consumption in cruise conditions. This is accomplished by restricting the flow of ventilation air (9th stage compressor bleed) to the interior of the high pressure compressor drum rotor, therely improving cycle performance. The reduced airflow also increases metal interface temperature and contributes to improved clearances at compressor blade tips and knife edge seals.

2. Description (Ref. Fig. 003, 004)
The HPC secondary flow control system controls air flow to the interior of the high compressor rotor. The flow of 9th stage compressor air to the rotor interior is controlled as a function of high rotor (N2) and altitude. The Full authority digital electronic control (FADEC) interfaces with the two HPC secondary flow control valves through two remotely mounted solenoid valve assemblies, HPC secondary flow control valve position is sensed as a switch closure and fed back to FADEC.

3. HPC Secondary Flow Control Valves (Ref. Fig. 004, 005)

A. Two HPC secondary flow control valves provide high temperature compressor air to the high compressor drum rotor compartment (6th stage throught 15th stage) in order to optimize compressor blade tip clearance for improved compressor efficiency.

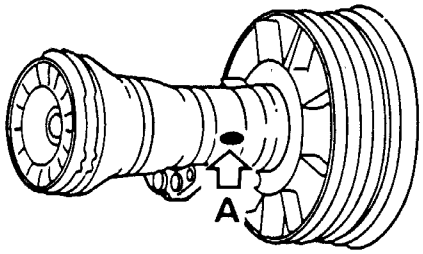
B. Each unit has 5 ports; 9th stage inlet pressure located in the mounting flange base, 15th stage pressure inlet, air supply port to the drum rotor located in the mounting flange base, and pneumatic servo pressure inlet and outlet ports.

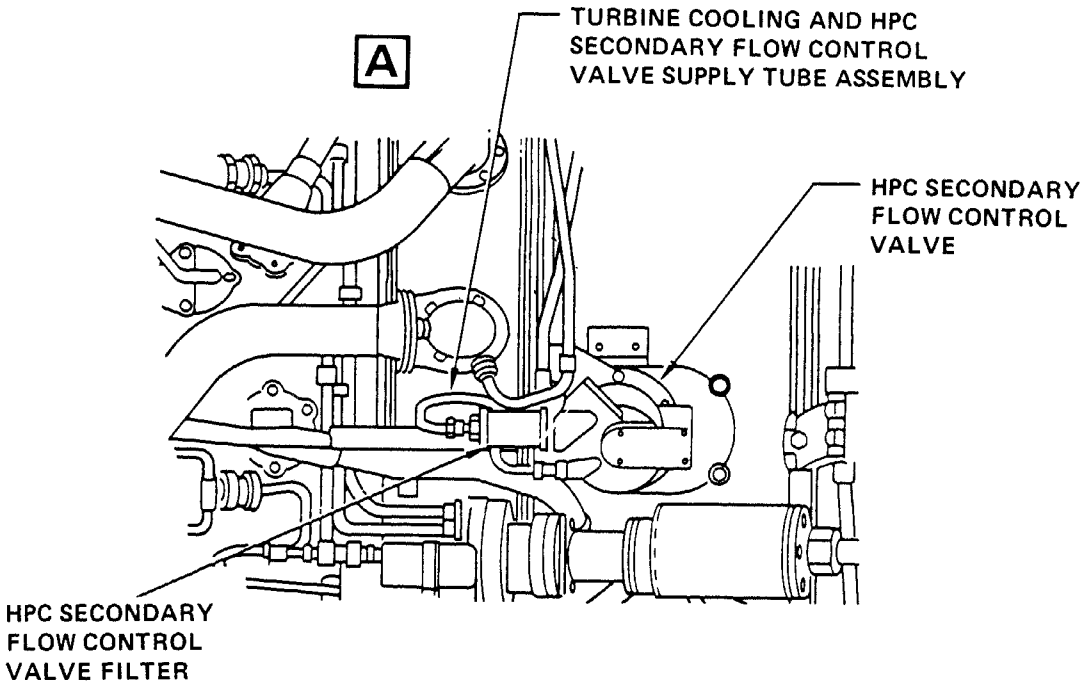
C. The two HPC secondary flow control valves, normally flowing 9th stage air, are actuated to flow 15th stage air at cruise conditions as a function of N2 and altitude, by two solenoid valves controlled by the FADEC. The solenoid valves provide pneumatic servo pressure (15th stage air) to translate the heating valve piston to shut off 9th stage air flow and allow restricted 15th stage air flow.

D. In the event, of pneumatic servo pressure loss or electrical signal failure to the solenoid, the valve piston is spring loaded (fail-safe) to flow 9th stage air.

4. HPC Secondary Flow Control Valve Filter (Ref. Fig. 006)

A. Description
(1)The air filter assembly consists of a case which houses a cylindrical type filter element which screws into the head assembly. The case screws into the head assembly also.

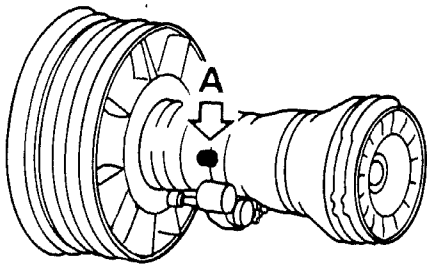


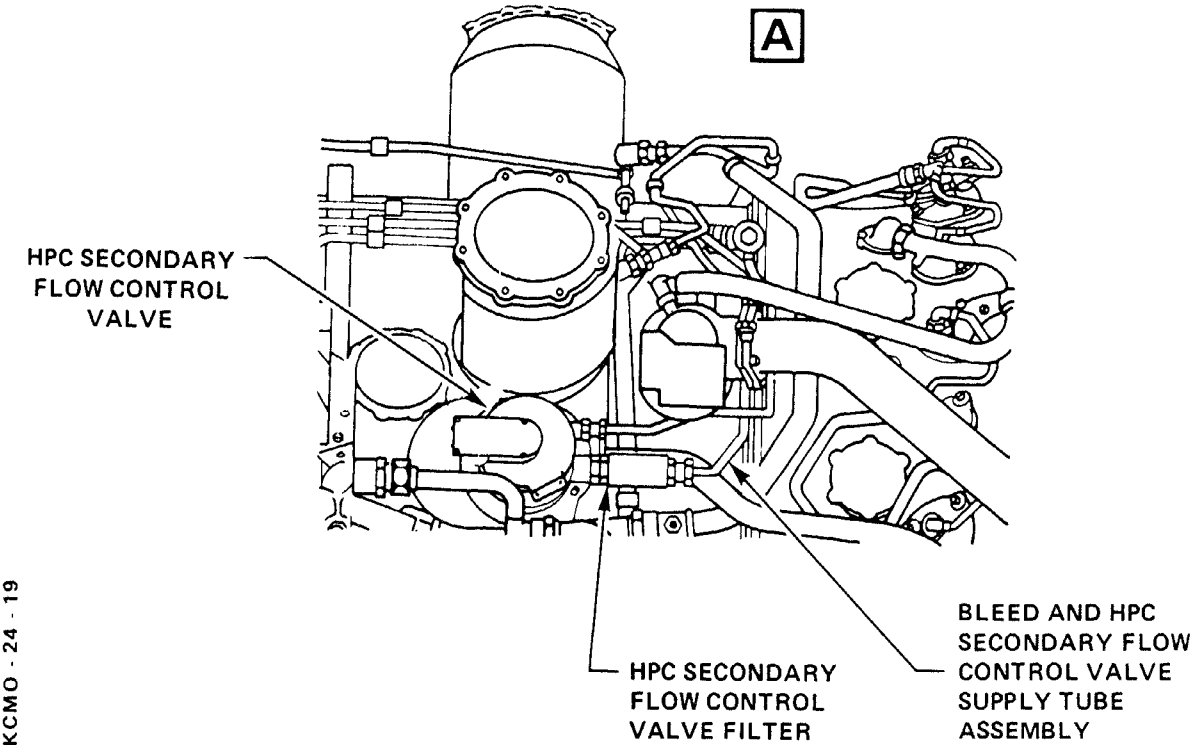

A
TURBINE COOLING AND HPC SECONDARY FLOW CONTROL VALVE SUPPLY TUBE ASSEMBLY
HPC SECONDARY FLOW CONTROL VALVE
HPC SECONDARY FLOW CONTROL VALVE FILTER

BM5 75 33 00 0 KAMO - 24 - 19
DM5

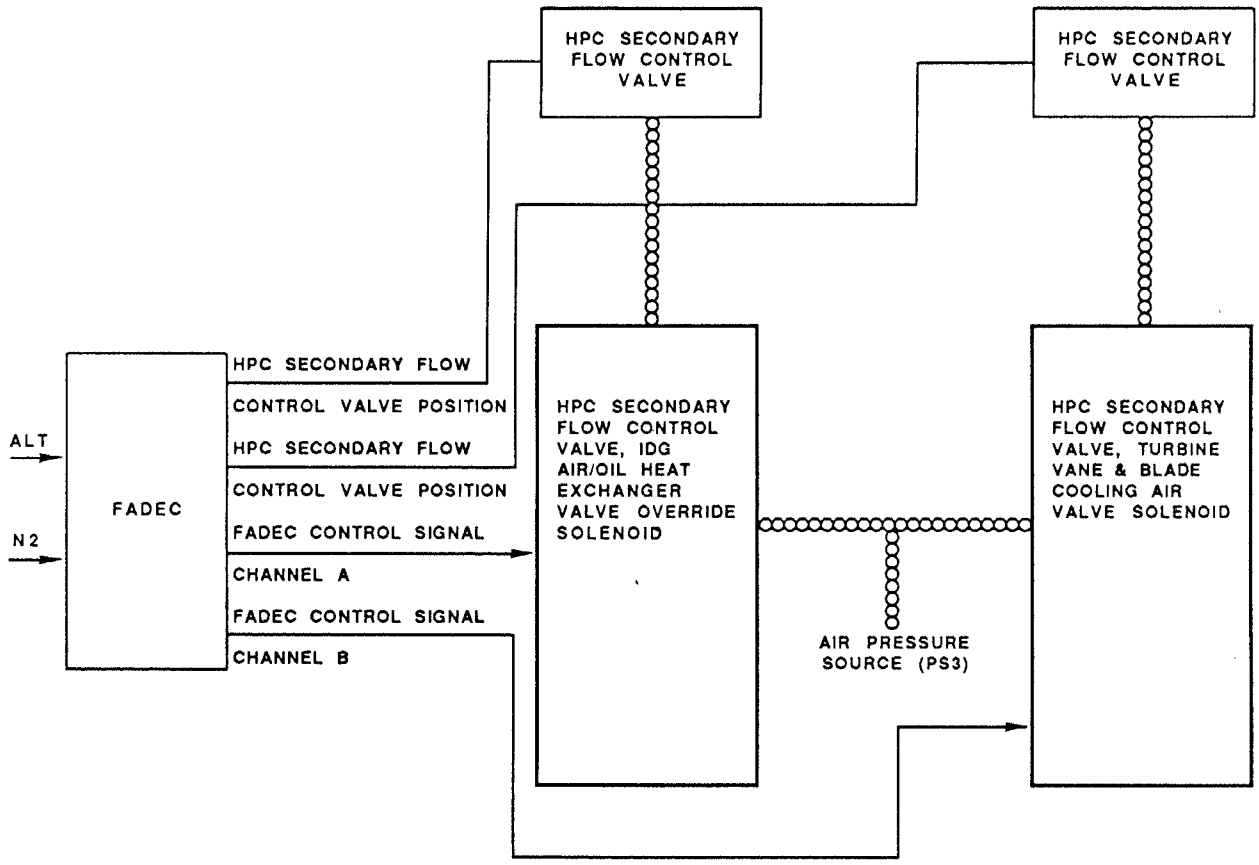
L-A0170

HPC Secondary Flow Control System - Component Location (Right Side)
Figure 001



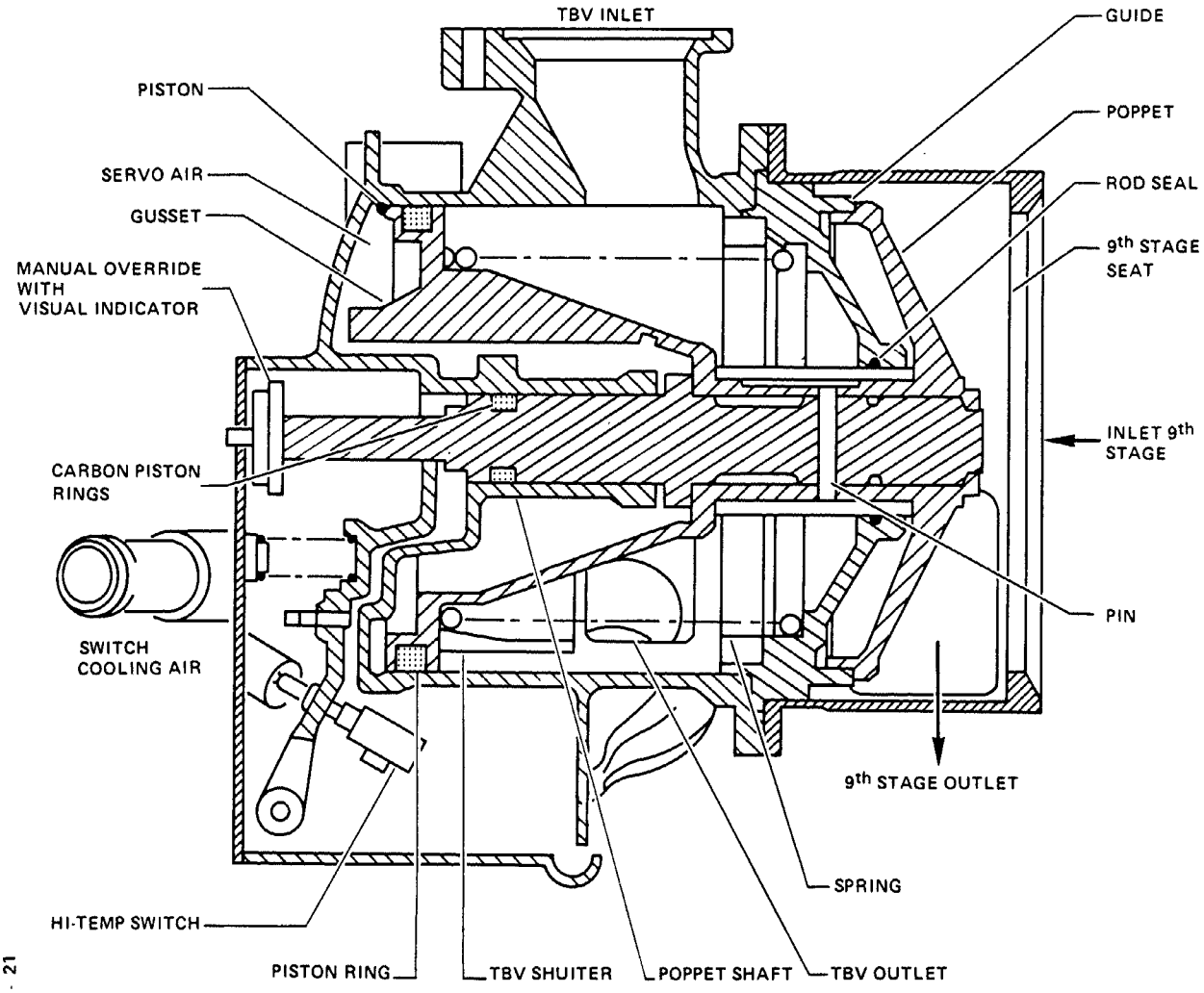

A
HPC SECONDARY FLOW CONTROL VALVE
HPC SECONDARY FLOW CONTROL VALVE FILTER
BLEED AND HPC SECONDARY FLOW CONTROL VALVE SUPPLY TUBE ASSEMBLY
BM5 75 33 00 0 KCMO - 24 - 19 DM5
L-A0169

HPC Secondary Flow Control System - Component Location (Left Side)
Figure 002


HPC SECONDARY FLOW CONTROL VALVE
HPC SECONDARY FLOW CONTROL VALVE
ALT
N2
FADEC
HPC SECONDARY FLOW
CONTROL VALVE POSITION
HPC SECONDARY FLOW
CONTROL VALVE POSITION
FADEC CONTROL SIGNAL
CHANNEL A
FADEC CONTROL SIGNAL
CHANNEL B
HPC SECONDARY FLOW CONTROL VALVE, IDG AIR/OIL HEAT EXCHANGER VALVE OVERRIDE SOLENOID
AIR PRESSURE SOURCE (PS3)
HPC SECONDARY FLOW CONTROL VALVE, TURBINE VANE & BLADE COOLING AIR VALVE SOLENOID

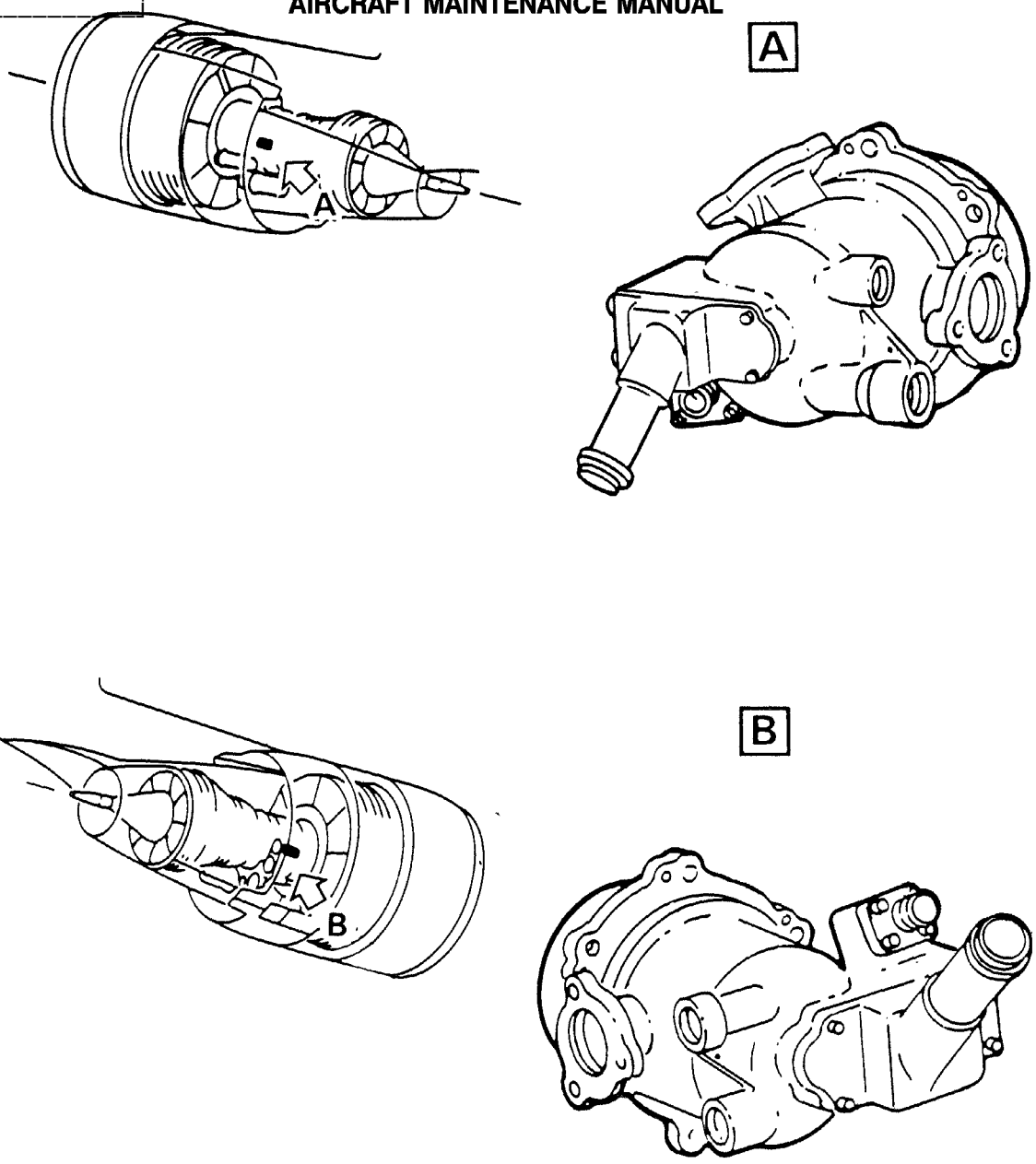
BM5 75 33 00 0 KGMO - 24 - 19
DM5

HPC Secondary Flow Control - Control
Figure 003



BM5 75 33 00 0 KJMO - 21

HPC Secondary Flow Control Valve - Cross Section
Figure 004



L-A1098
1086

BM5 75 33 00 0 KKMO - 24 - 19
DM5

HPC Secondary Flow Control Valves
Figure 005

(2)The head assembly contains a bypass valve (poppet, spring, and valve head).

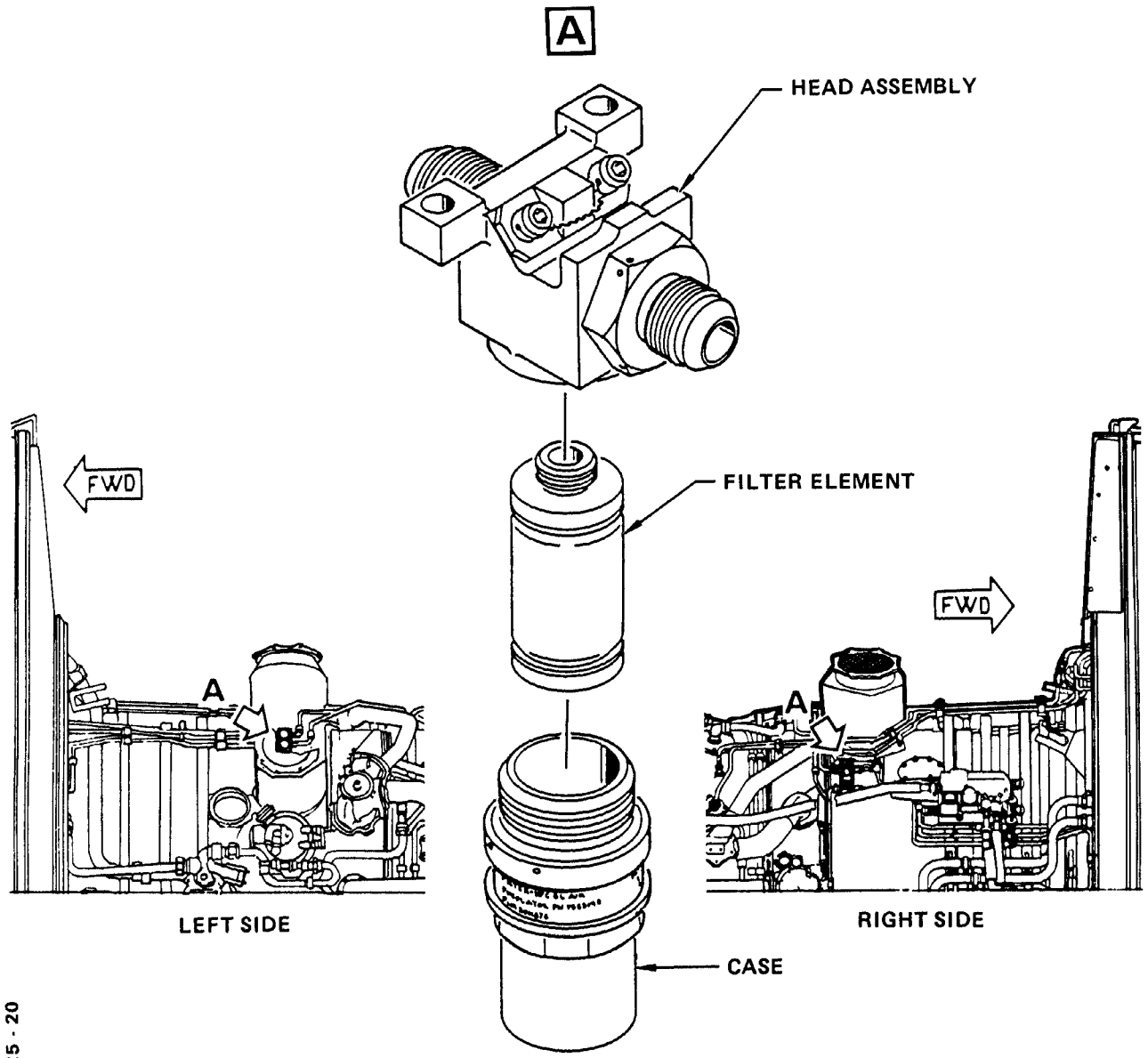
B. Operation
(1)Filter operation occurs as PS3 (15 stage) air flows through the filter element. A bypass valve opens at 5 psid (34.5 KPad) in the event of excessive filter restriction.

5. HPC Secondary Flow Control Solenoid Valves

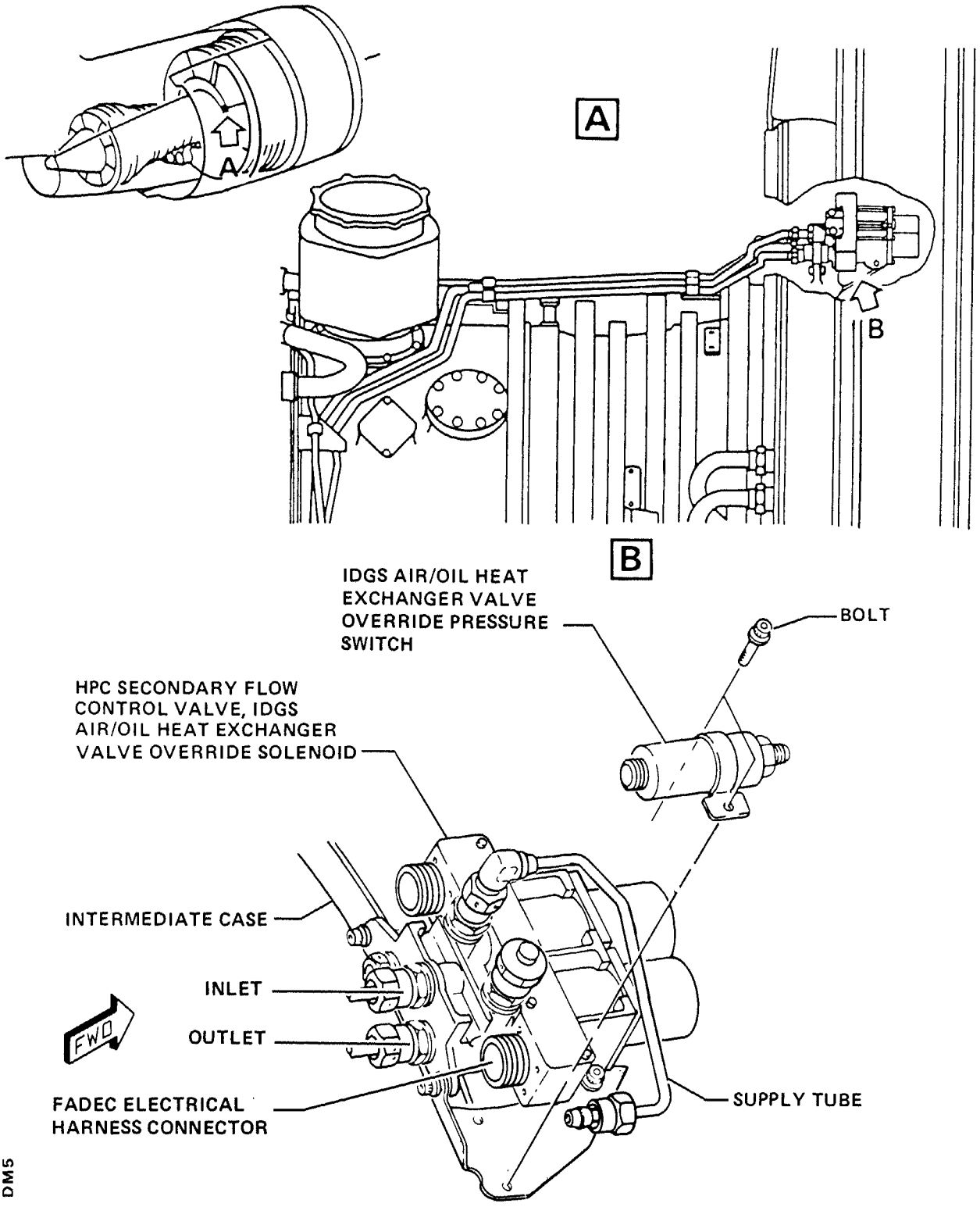
A. General (Ref. Fig. 007, 008)
There are two solenoid valves controlled by the FADEC. They provide pneumatic servo pressure to actuate different components (see below).

B. HPC Secondary Flow Control Valve, IDG Air/Oil Heat Exchanger Valve Override Solenoid (Ref. Fig. 007)
This four way solenoid valve is located at 1 o'clock in the low pressure compressor compartment.
The valve provides an actuating pressure dedicated to one of the right HPC secondary flow control valve and in addition the solenoid valve assembly provides actuation pressure to the IDG air/oil heat exchanger valve override pressure switch (Ref. 75-21-00).
The solenoid valve is energized by the FADEC and is fail safe to provide actuating pressure to cause the HPC flow control valve to flow air.

C. HPC Secondary Flow Control Valve, Turbine Vane and Blade Cooling Air Valve Solenoid (Ref. Fig. 008)
This four way solenoid valve is located at 10'clock in the low pressure compressor compartment.
The valve provides an actuating pressure to one of the left HPC secondary flow control valve. The solenoid valve assembly also provides actuation pressure for two turbine vane and blade cooling air valves.
The solenoid valve is energized by the FADEC and is fail safe to provide actuating pressure to cause the HPC control valve to supply the 9th stage cooling airflow, and the turbine vane cooling valves to supply the 12th stage airflow.



HPC Secondary Flow Conrol Valve Filter
Figure 006



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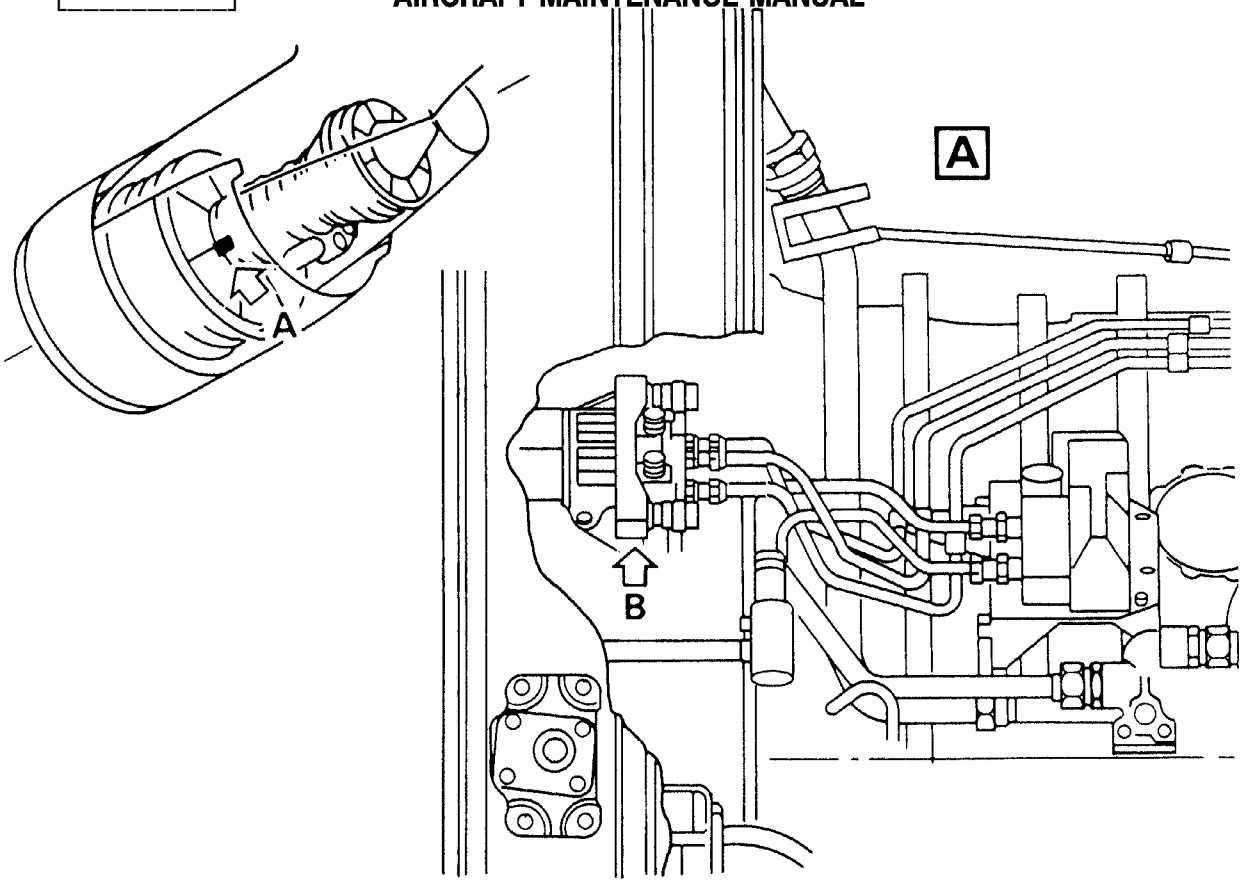
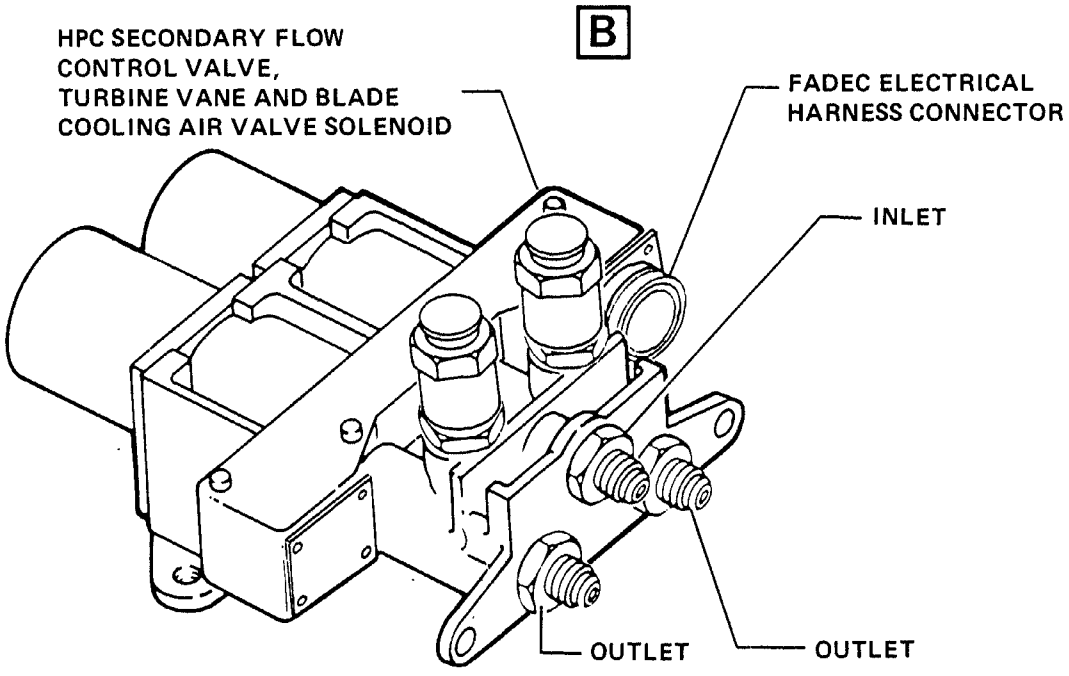
HPC Secondary Flow Control Valve, IDG Air/Oil Heat Exchanger Valve Override Solenoid
Figure 007





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HPC Secondary Flow Control Valve, Turbine Vane and Blade Cooling Air Valve Solenoid
Figure 008

HPC SECONDARY FLOW CONTROL VALVE - INSPECTION/CHECK

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

1. Equipment and Materials

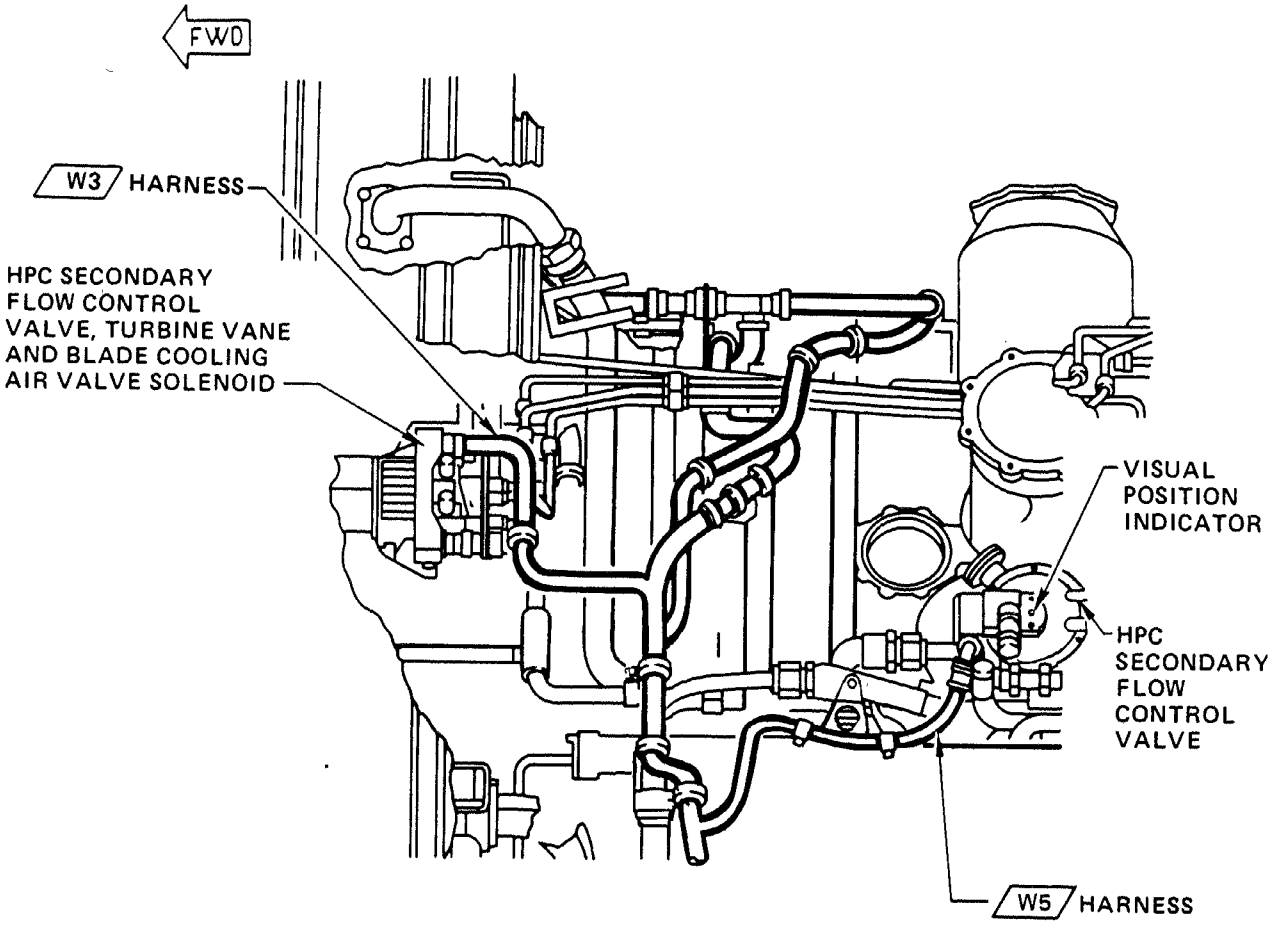
ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

2. Inspect HPC Secondary Flow Control Valve

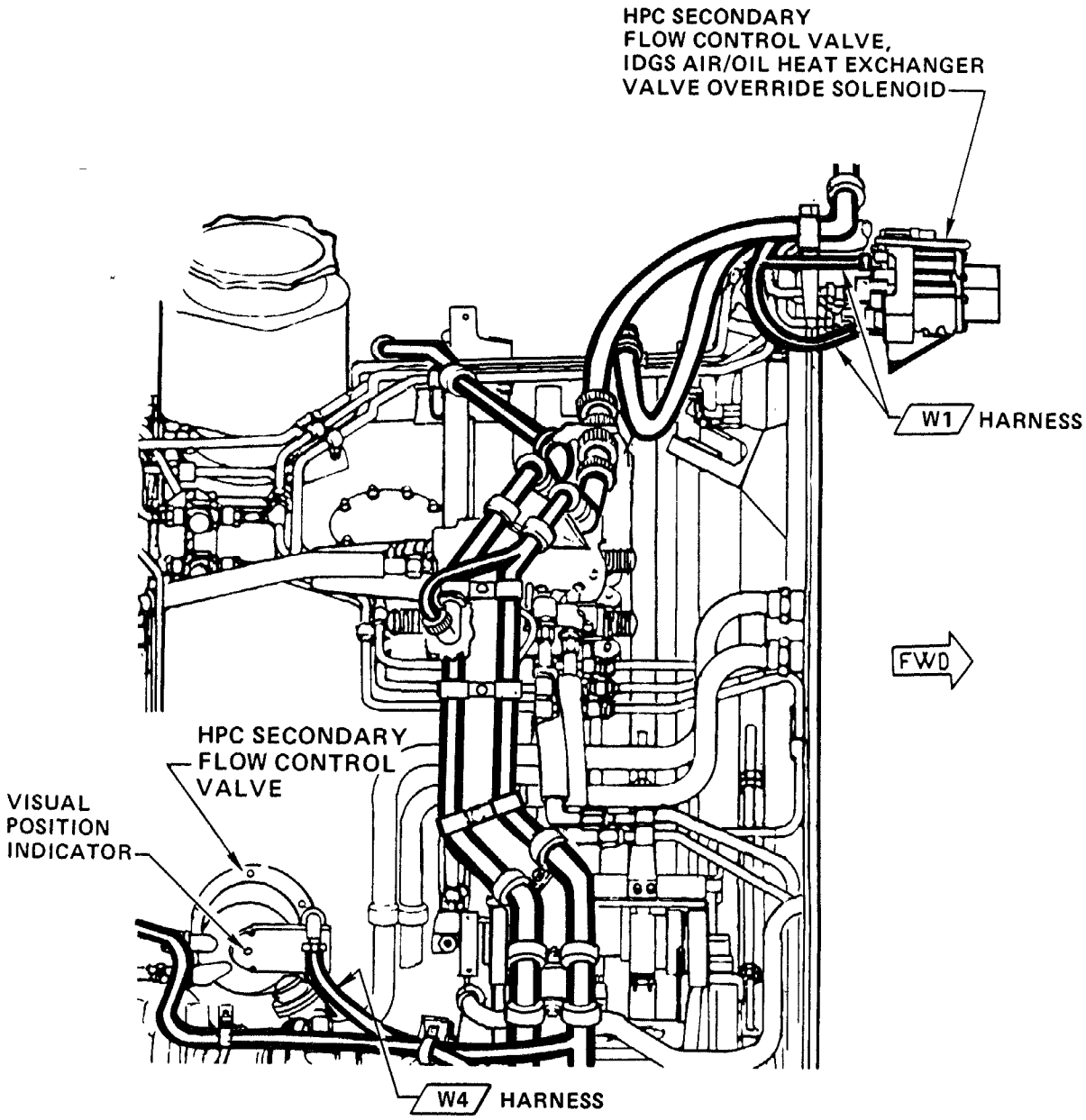
A. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2) Install access platform.

B. Procedure (Ref. Fig. 601, 602)
(1) Inspect HPC secondary flow control valve and HPC secondary flow control valve, turbine vane and blade cooling air valve solenoid for physical condition and security.
(2) Check HPC secondary flow control valve visual position indicator pin.
NOTE : Valves are spring loaded open when deactivated.
(a) An extended pin indicates, valve is fully open (normal condition).
(b) If pin is not fully extended, valve may be partially or fully closed. Replace valve.
(3) Inspect plumbing and brackets for physical condition and security.
(a) Cracked or crimped tubes are not acceptable and must be replaced.
(b) Minor surface damage is acceptable provided the function of the system is not compromised.
(4) Inspect electrical harnesses for chafing and/or loose connectors. Replace as required.

C. Close-Up
(1) Remove access platform.
(2) Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).


FWD
W3 HARNESS
HPC SECONDARY FLOW CONTROL VALVE, TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID
VISUAL POSITION INDICATOR
HPC SECONDARY FLOW CONTROL VALVE
W5 HARNESS
BM5 75 33 00 6 KAMO - 25 - 20
DM5
L-A4448

HPC Secondary Flow Control Valve (Left)
Figure 601



HPC Secondary Flow Control Valve (Right)
Figure 602

HPC SECONDARY FLOW CONTROL VALVE - REMOVAL/INSTALLATION

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Protective Closures
C.	Protective Covers
D.	Access Platform
E.	Torque Wrench
F.	Gaskets
G.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
H. Material No.P03-001	Oils (Ref. 70-00-00)
J. Material No.P05-059	Special Materials (Ref. 70-00-00)
K. Material No.P05-289	Special Materials (Ref. 70-00-00)
L. Material No.P05-291	Special Materials (Ref. 70-00-00) (Optional)
M. Material No.P05-292	Special Materials (Ref. 70-00-00) (Optional)
N. Material No.P06-021	Lubricants (Ref. 70-00-00)
P.	Corrosion Resistant Steel Lockwire (AS3214-01) (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General
- 36-11-12, P. Block 401	HP Valve

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
Engine 1			
133VU	ENG1 - SCU SUPPLY GND	35KS	333/T76
133VU	ENG1 - SCU SUPPLY FLT	37KS	333/T75
Engine 2			
133VU	ENG2 - SCU SUPPLY GND	34KS	333/T85
133VU	ENG2 - SCU SUPPLY FLT	36KS	333/T84

(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(3)Install access platform.

B. Removal

(1)HPC secondary flow control valve (left) (Ref. Fig. 401)

(a)Remove lockwire and disconnect W5P10 harness connector from valve. Install protective cover.

Post SB PW4 ENG 75-85 and SB PW4 ENG 75-116

(b)Remove the lockwire and disconnect the signal tube (AA16) from the adapter.

Post SB PW4 ENG 72-211 Only

(c)Remove bolt and nut securing tube to bracket attached to rear of valve.

Post SB PW4 ENG 79-52

(d)Remove the nut and bolt from a clamp that attaches the tube (LP32) to the bracket on the secondary flow control valve.

End Post SB PW4 ENG 79-52

(e)Remove six bolts and a bracket (Post SB PW4 ENG 79-52) from the valve to HPC case. Remove valve from case. Discard gasket. Install protective closures on HPC case pad and on valve signal tube.

(f)If valve is to be replaced, comply with the following :

Pre SB PW4 ENG 75-85

1 Remove lockwire from the cap assembly and the cap assembly from adapter.

End Pre SB PW4 ENG 75-85

2 Remove the adapter and the gasket from the valve. Install protection covers.

NOTE : HPC air valve signal tube (AA16) was removed and cap assemblies installed on the air filter and the HPC air valve by Alert SB PW4 ENG 75-62R2.

NOTE : HPC air valve signal tube (AA16) was (re)installed and the cap assemblies were removed from the air filter and the HPC air valve by SB PW4 ENG 75-85.

3 Remove lockwire, plug, and gasket from adjacent port. Install protective closure.

Pre SB PW4 ENG 72-211

4 If necessary remove lockwire and remove six bolts securing two covers to valve. Remove covers and install protective closures.

Post SB PW4 ENG 72-211 Only

4 If necessary remove lockwire and remove six bolts securing two covers and bracket to valve. Remove covers and install protective closures.

End SB PW4 ENG 72-211

(2)HPC secondary flow control valve (right) (Ref. Fig. 402)

(a)Remove lockwire and disconnect W4P10 harness connector from valve. Install protective cover.

Post SB PW4 ENG 75-85 and Pre SB PW4 ENG 75-116

(b)Remove the lockwire and disconnect the signal tube (AA15) from the adapter.

Post SB PW4 ENG 75-116

(b)Remove the lockwire and disconnect the signal tube (AA91) from the adapter.

End SB PW4 ENG 75-116

(c)Remove six bolts securing valve to HPC case. Remove valve from case. Discard gasket. Install protective closures on HPC case pad.

(d)If valve is to be replaced, comply with the following :

Pre SB PW4 ENG 75-85

1 Remove lockwire from the cap assembly and the cap assembly from adapter.

End Pre SB PW4 ENG 75-85

2 Remove the adapter and the gasket from the valve.
Install protection covers.
NOTE : HPC air valve signal tube (AA15) was removed and cap assemblies installed on the air filter and the HPC air valve by Alert Service Bulletin, PW4 ENG 75-62R2.
NOTE : HPC air valve signal tube (AA15) was (re)installed and the cap assemblies were removed from the air filter and the HPC air valve by SB PW4 ENG 75-85.
Remove lockwire, plug, and gasket from adjacent port. Install protective closure.
Remove six bolts securing two covers to valve.
Remove covers and install protective closures.

C. Installation

(1)HPC secondary flow control valve (left) (Ref. Fig. 401)

(a)If new valve is to be installed comply with the following :

1 With valve on bench and viewed as in (Ref. Fig. 401), remove protective closures from valve ports. Install gasket on plug. Install plug, threads lubricated with Engine Oil (Material No.P03-001), into lower outboard port of valve. TORQUE plug to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plug.

Pre SB PW4 ENG 72-211

2 Install three-hole cover, with air vent holes to valve port and towards valve flange, to rear port. Secure cover with three bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety bolts which have lockwire holes.

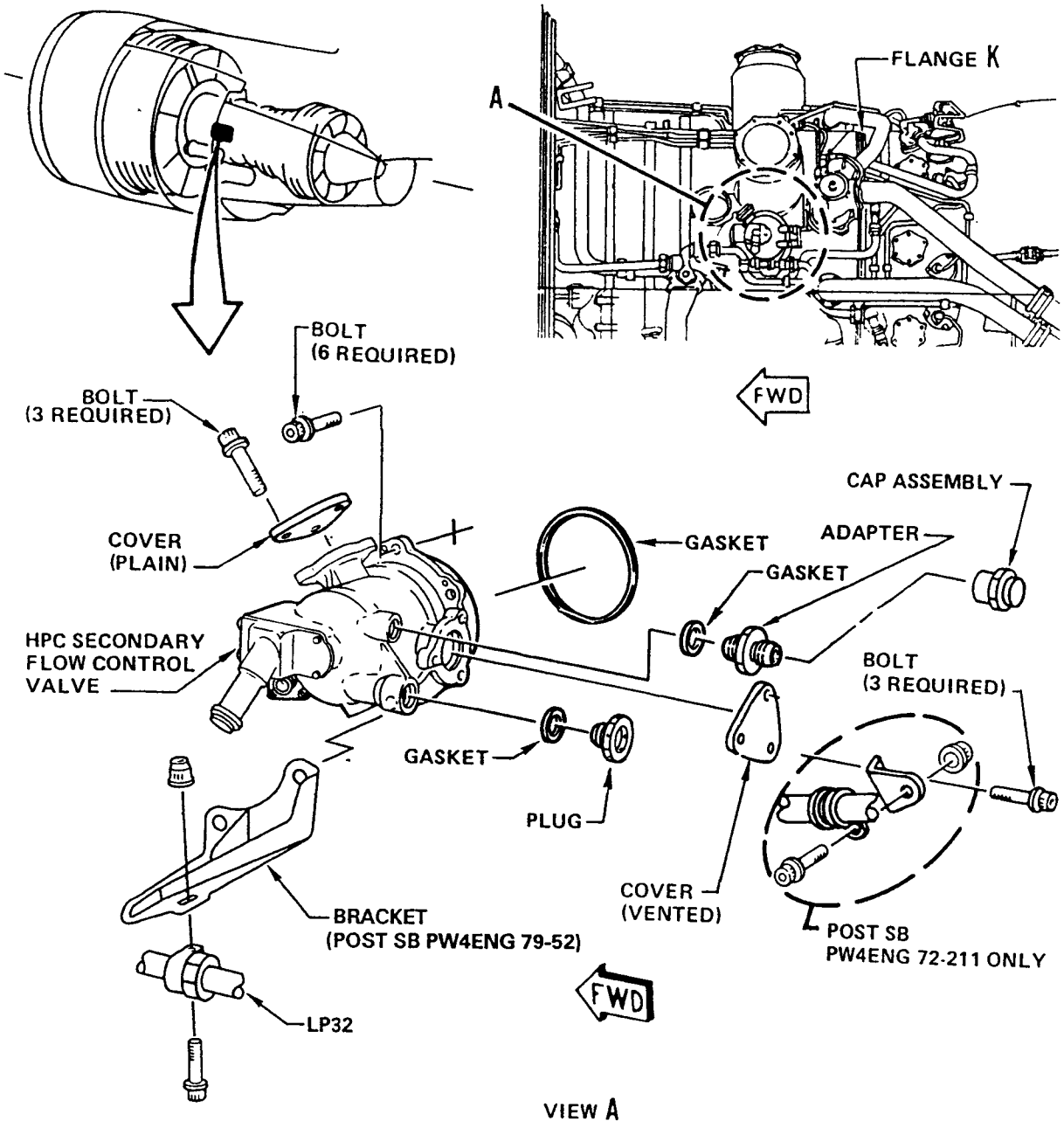
Post SB PW4 ENG 72-211 Only

2 Install three-hole cover, with air vent holes to valve port towards valve flange, to rear port. Secure cover and bracket with three bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety bolts which have lockwire holes.

End SB PW4 ENG 72-211

3 Install plain three-hole cover to remaining three-hole port. Secure cover with three bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety bolts which have lockwire holes.

4 Install gasket on adapter. Install adapter, threads lubricated with Engine Oil (Material No.P03-001), into remaining threaded valve port. TORQUE adapter to between 110 and and 120 lbf.in.



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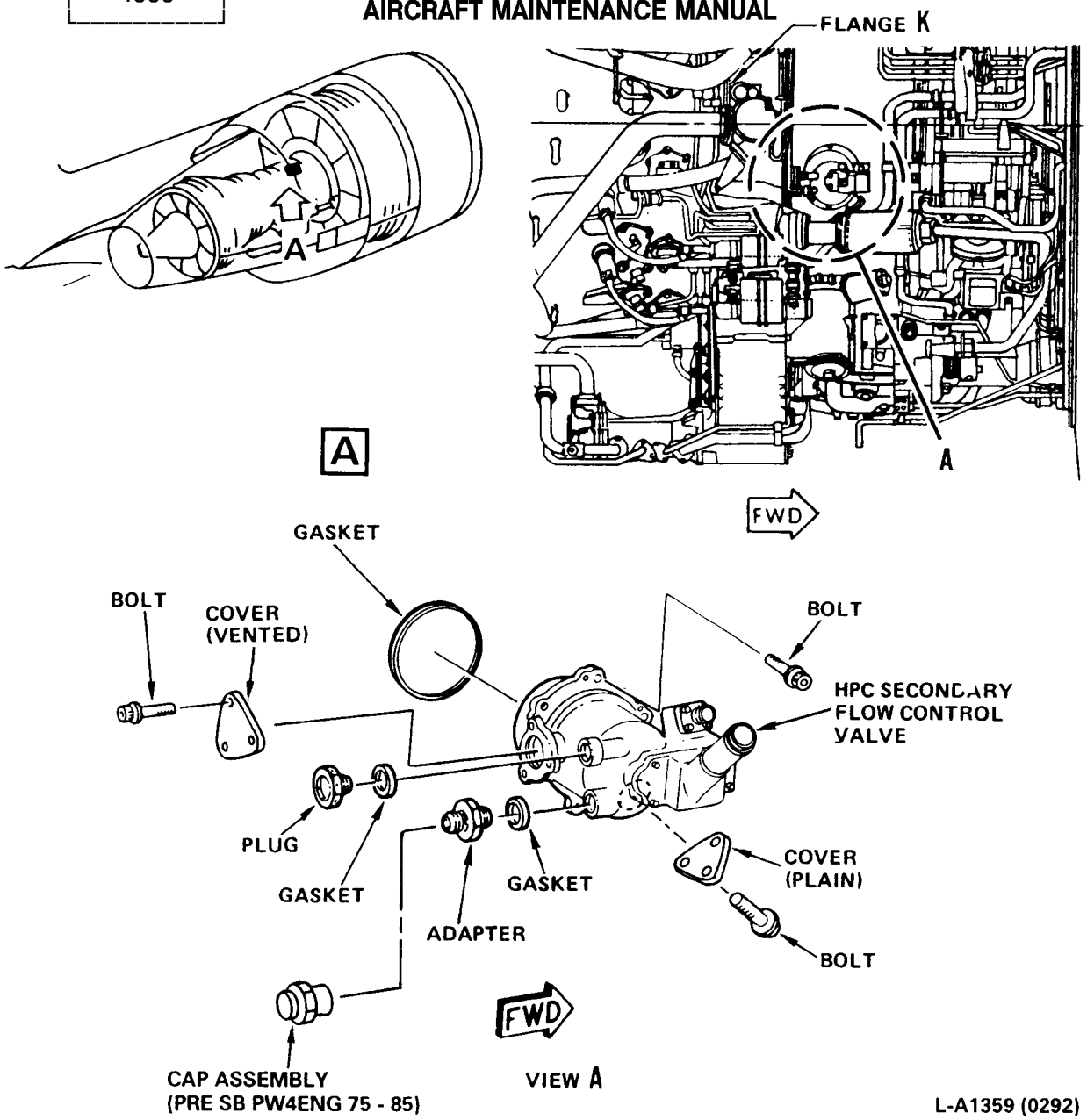
HPC Secondary Flow Control Valve (Left)
Figure 401



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HPC Secondary Flow Control Valve (Right)
Figure 402

(1.24 and 1.35 m.daN).

Pre SB PW4 ENG 75-82

5 Lubricate the threads of the adapter with Engine Oil (Material No.P03-001). Install a cap assembly onto the adapter and TORQUE the cap assembly to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN). Wirelock the cap assembly.

End Pre SB PW4 ENG 75-82

NOTE : HPC air valve signal tube (AA16) was removed and cap assemblies installed on the air filter and the HPC air valve by Alert Service Bulletin PW4 ENG 75-62R2.

NOTE : HPC air valve signal tube (AA16) was (re)installed and the cap assemblies were removed from the air filter and the HPC air valve by SB PW4 ENG 75-85.

(b)Remove protective closures. Install gasket on HPC case pad. Secure gasket in place with Paraffin Wax (Material No.P05-059).

(c)Install valve on pad aligning offset hole. Secure valve with six bolts, threads lubricated with Engine Oil (Material No.P03-001). Install a bracket (Post SB PW4 ENG 79-52) to the lower flange of the secondary control flow valve. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN) then retorque to same torque without loosening.

(d)(Post SB PW4 ENG 79-52) Install a nut and bolt, threads lubricated with Engine Oil (Material No.P03-001) and attach the clamp on the tube (LP32) to a bracket on the secondary flow control valve. TORQUE the nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

Post SB PW4 ENG 75-85 and Post SB PW4 ENG 75-116

(e)Lubricate the threads with Antigalling Compound (Material No.P06-021), and connect the signal tube (AA16) to the adapter on the rear of the valve. TORQUE the tube nut to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the nut.

End SB PW4 ENG 75-85 and SB PW4 ENG 75-116

(f)Remove protective closures. Connect W5P10 harness connector to valve.

CAUTION : ENSURE SPECIFIED TORQUE WRENCH READING IS ADHERED TO. INCORRECT CONNECTOR TORQUE COULD RESULT IN CONNECTOR DAMAGE AND INADEQUATE LIGHTNING PROTECTION.

(g)Tighten and TORQUE connector to between 21 and 26 lbf.in. (0.24 and 0.29 m.daN) and wirelock with AS3214-01.

Post SB PW4 ENG 72-211 Only

(h)Install bolt, lubricated with Engine Oil (Material No.P03-001) and nut securing tube clamp to bracket on rear of valve. TORQUE the bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

End SB PW4 ENG 72-211.

(i)Install high pressure valve (Ref. 36-11-12, P. Block 401).

(2)HPC secondary flow control valve (right) (Ref. Fig. 402)

(a)If new valve is to be installed comply with the following :

1 With valve on bench and viewed as in (Ref. Fig. 402) remove protective closures from valve ports. Install gasket on plug. Install plug, threads lubricated with Engine Oil (Material No.P03-001),

into upper outboard port of valve. TORQUE plug to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the plug.

2 Install three-hole cover, with air vent holes away from operator and towards valve, to rear port.
Secure cover with three bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

3 Install plain three-hole cover to remaining three hole port. Secure cover with three bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

4 Install gasket on adapter. Install adapter, threads lubricated with Engine Oil (Material No.P03-001), into remaining threaded valve port. TORQUE adapter to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN).

Pre SB PW4 ENG 75-85

5 Lubricate the threads of the adapter with Engine Oil (Material No.P03-001). Install a cap assembly onto the adapter and TORQUE the cap assembly to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the cap assembly.

End Pre SB PW4 ENG 75-85

NOTE : HPC air valve signal tube (AA15) was removed and cap assemblies installed on the air filter and the HPC air valve by Alert Service Bulletin PW4 ENG 75-62R2.

NOTE : HPC air valve signal tube (AA15) was (re)installed and the cap assemblies were removed from the air filter and the HPC air valve by SB PW4 ENG 75-85.

(b)Remove protective closures. Install gasket on HPC case pad. Secure gasket in place with Paraffin Wax (Material No.P05-059).

(c)Install valve on pad aligning offset hole. Secure valve with six bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN) then retorque to same torque without loosening until torque is maintained.

Post SB PW4 ENG 75-85 and Pre SB PW4 ENG 75-116

(d)Lubricate the threads with Antigalling Compound (Material No.P06-021), and connect the signal tube (AA15) to the adapter on the rear of the valve. TORQUE the tube nut to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the nut.

Post SB PW4 ENG 75-116

(d)Lubricate the threads with Antigalling Compound (Material No.P06-021), and connect the signal tube (AA91) to the adapter on the rear of the valve. TORQUE the tube nut

to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).
Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the nut.

End SB PW4 ENG 75-116

(e)Remove protective closures. Connect electrical cable to connector to valve. Connect W4P10 harness connector to valve.

CAUTION : ENSURE SPECIFIED TORQUE WRENCH READING IS ADHERED TO. INCORRECT CONNECTOR TORQUE COULD RESULT IN CONNECTOR DAMAGE AND INADEQUATE LIGHTNING PROTECTION.

(f)TORQUE connector to between 21 and 26 lbf.in. (0.24 and 0.29 m.daN) and wirelock with AS3214-01.

D. Close-Up and Test

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers : 34KS, 35KS, 36KS, 37KS.
(5)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501)

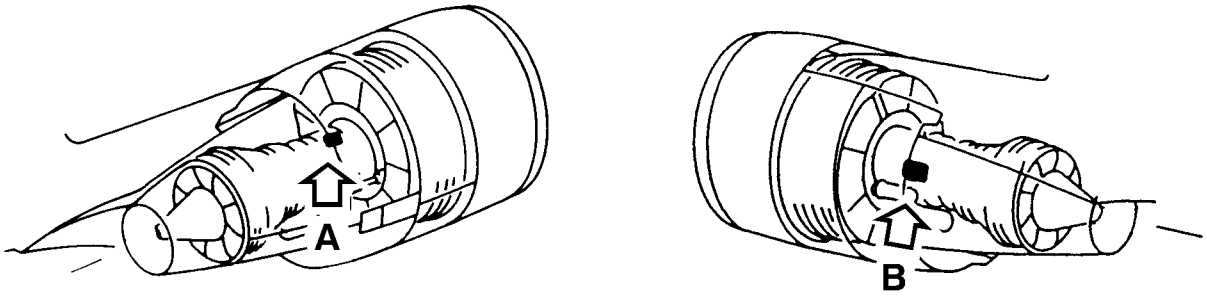
HPC SECONDARY FLOW CONTROL VALVE - ADJUSTMENT/TEST

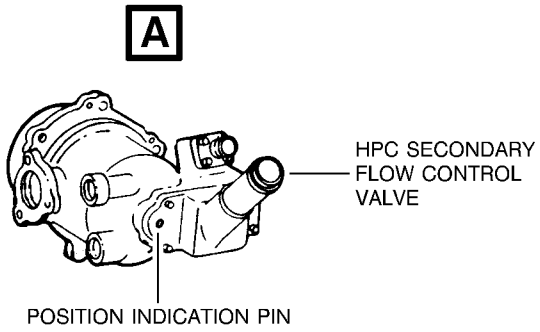
1. Check of TRC Valves Position Indicator Pins

A. Job Set-Up
(1)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Visual Inspection of the Position Indicator Pins
(1)Visually inspect position indicator pins on the TRC valves located on the HPC case (Ref. Fig. 501).
NOTE : Pins in the popped up position are at the same level as the top of the TRC valve.
NOTE : The position indicator pins must be popped up. If the TRC valves indicator pins are not popped up, the valve is stuck in the closed position.

C. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).





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Location of TRC Valves
Figure 501

HPC SECONDARY FLOW CONTROL VALVE FILTER - REMOVAL INSTALLATION

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

1. Equipment and Materials

ITEM	DESIGNATION
A.	Access Platform
B.	Circuit Breaker Safety Clips
C.	Torque Wrench
D.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
E.	Corrosion Resistant Steel Lockwire (MS20995C32) (Ref. 70-00-00)
F.	Protective Closures
G. Material No.P03-001	Oils (Ref. 70-00-00)
R H. Material No.P06-054	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General
- 75-24-14, P. Block 401	Turbine Vane and Blade Cooling Air Valve Filter

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Removal
(1)HPC secondary flow control valve filter
(a)Left HPC secondary flow control valve filter (Ref. Fig. 401)
1 Remove lockwire and disconnect the tube(s) from lower air filter attached to Flange J bracket at approximately 11 o'clock position.

PRE SB PW4ENG 75-85

2 Remove lockwire from the cap assembly on the lower air filter. Remove the cap assembly from the air filter.

END PRE SB PW4ENG 75-85

NOTE : HPC air valve signal tube was removed and cap assemblies installed on the air filter and the HPC air valve by Alert Service Bulletin, PW4 ENG 75-62R2.

NOTE : HPC air valve signal tube was (re)installed and the cap assemblies were removed from the air filter and the HPC air valve by SB PW4ENG 75-85.

3 Remove bolts securing air filter to bracket and remove filter.
4 Install protective closures.
NOTE : For removal of upper left filter (Ref. 75-24-14, P. Block 401).
(b)Right HPC secondary flow control valve filters (Ref. Fig. 402).

1 Remove lockwire and disconnect tube(s) from air filters attached to Flange J bracket at approximately 1:30 o'clock position.

PRE SB PW4ENG 75-85

2 Remove lockwire from the cap assembly on the lower air filter. Remove the cap assembly from the air filter.

END PRE SB PW4ENG 75-85

NOTE : HPC air valve signal tube was removed and cap assemblies installed on the air filter and the HPC air valve by Alert Service Bulletin PW4 ENG 75-62R2.

NOTE : HPC air valve signal tube was (re)installed and the cap assemblies were removed from the air filter and the HPC air valve by SB PW4ENG 75-85.

2 Remove bolts and nuts securing filters to bracket and remove filters.

3 Install protective closures.

NOTE : For removal of remaining filter (Ref. 75-24-14, P. Block 401).

(2)HPC secondary flow control valve filter element (Ref. Fig. 403)

NOTE : Procedure for removal of filter elements from left and right side of engine is the same.

(a)Remove lockwire and unscrew case from head assembly.

(b)Unscrew filter element from head assembly.

(c)Install protective closure on head assembly.

NOTE : For removal of remaining filter elements (Ref. 75-24-14, P. Block 401).

C. Installation

(1)HPC secondary flow control valve filter

(a)Left HPC secondary flow control valve filter (Ref. Fig. 401).

1 Position air filter to lower set of holes in Flange J bracket at approximately 11 o'clock position. Secure in place with bolts, threads lubricated with Material No.P03-001 and nuts. TORQUE bolts to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN).

2 Remove protective closures

R 3 Install tube nut(s), threads lubricated with Material No.P06-054, to filter. TORQUE tube nut(s) to between 200 and 225 lbf. in. (2.26 and 2.54 m.daN). Attach forward tube to forward hex adapter with lockwire.

POST SB PW4ENG 75-85

Attach the rear tube with lockwire.

END POST SB PW4ENG 75-85

4 Install a cap assembly, threads lubricated with Material No.P03-001 to the air filter. TORQUE the cap assembly to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN). Wirelock the cap assembly.

NOTE : HPC air valve signal tube was removed and cap assemblies installed on the air filter and the HPC air valve by Alert Service Bulletin PW4 ENG 75-62R2.

NOTE : HPC air valve signal tube was (re)installed and the cap assemblies were removed from the air filter and the HPC air valve by SB PW4ENG 75-85.

NOTE : For installation of upper left filter (Ref. 75-24-14, P. Block 401).

(b)Right HPC secondary flow control valve filters (Ref. Fig. 402).

1 Position air filter to Flange J bracket at approximately 1:30

o'clock position and secure with bolts, threads lubricated with Material No.P03-001, and nuts.
TORQUE bolts to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN).

2 Remove protective closures.

R 3 Install tube nut(s), threads lubricated with Material No.P06-054, to filters. TORQUE tube nut(s) to between 200 and 225 lbf. in. (2.26 and 2.54 m.daN).

POST SB PW4ENG 75-85

Attach forward tube with lockwire to forward hex adapter. Attach rear tube with lockwire to filter covers.

PRE SB PW4ENG 75-85

4 Install a cap assembly, threads lubricated with Material No.P03-001, to the lower air filter. TORQUE the cap assembly to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN). Wirelock the cap assembly.

NOTE : HPC air valve signal tube was removed and cap assemblies installed on the air filter and the HPC air valve by Alert Service Bulletin PW4 ENG 75-62R2.

NOTE : HPC air valve signal tube was (re)installed and the cap assemblies were removed from the air filter and the HPC air valve by SB PW4ENG 75-85.

NOTE : For installation of remaining filter (Ref. 75-24-14, P. Block 401).

(2)HPC secondary flow control valve filter element (Ref. Fig. 403)

NOTE : Procedure for installation of filter elements from left and right side of engine is the same.

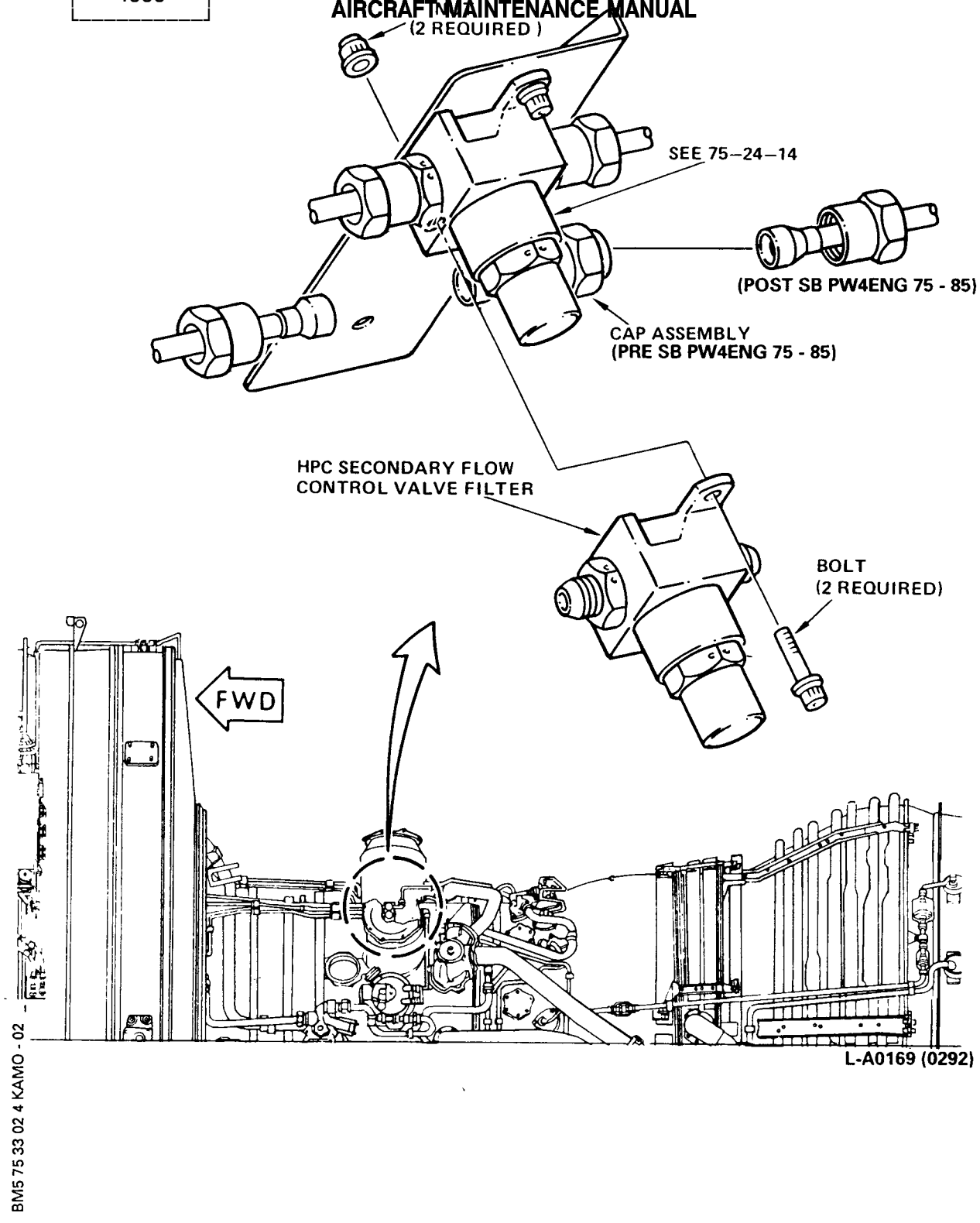
(a)Remove protective closure from head assembly.
(b)Screw filter element into head assembly. Tighten filter element hand-tight.
(c)Install case and TORQUE to between 240 and 300 lbf.in. (2.72 and 3.38 m.daN).
(d)Wirelock case to head assembly.

NOTE : Using corrosion resistant steel lockwire MS20995C32

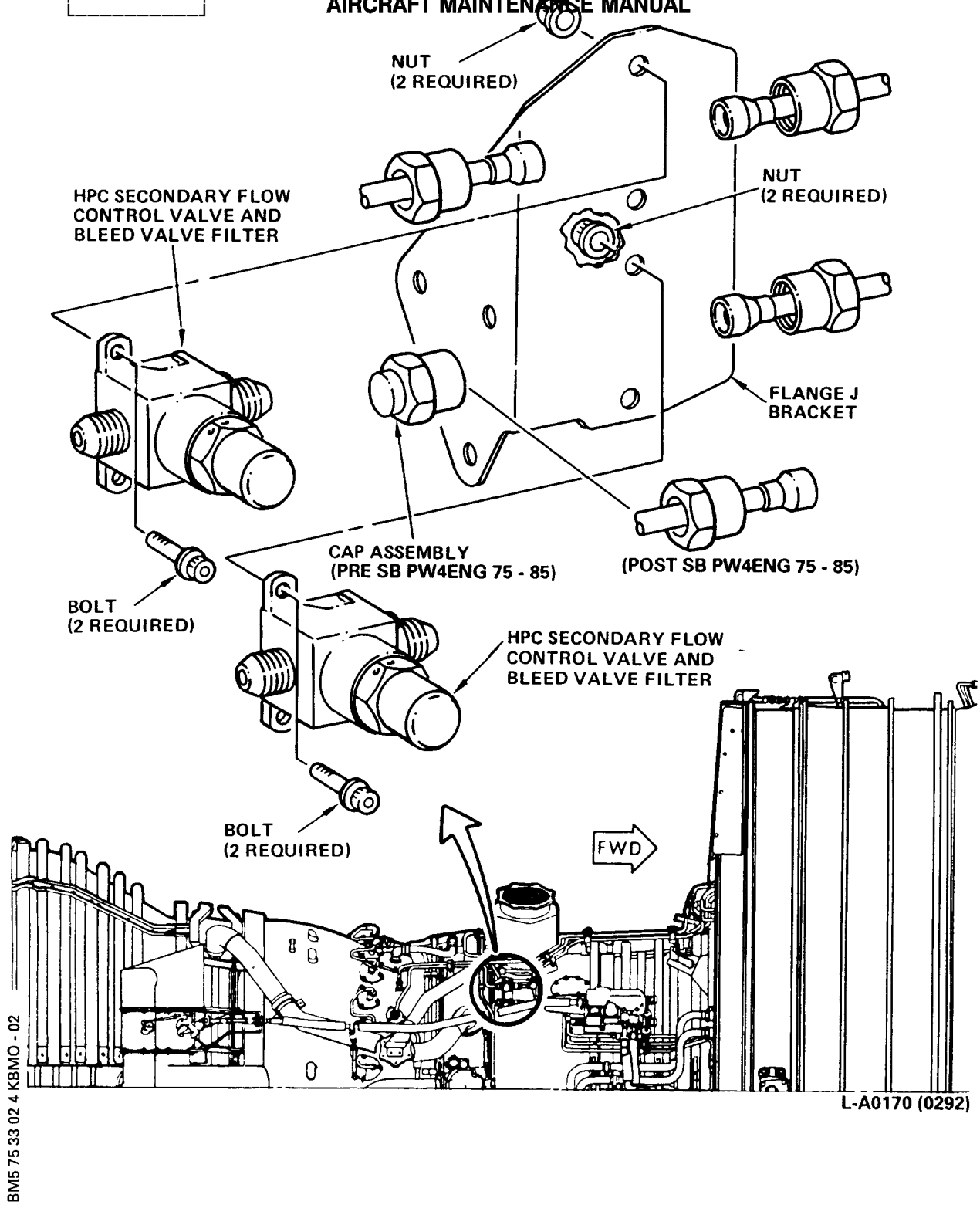
NOTE : For installation of remaining filter elements (Ref. 75-24-14, P. Block 401).

D. Close-Up and Test

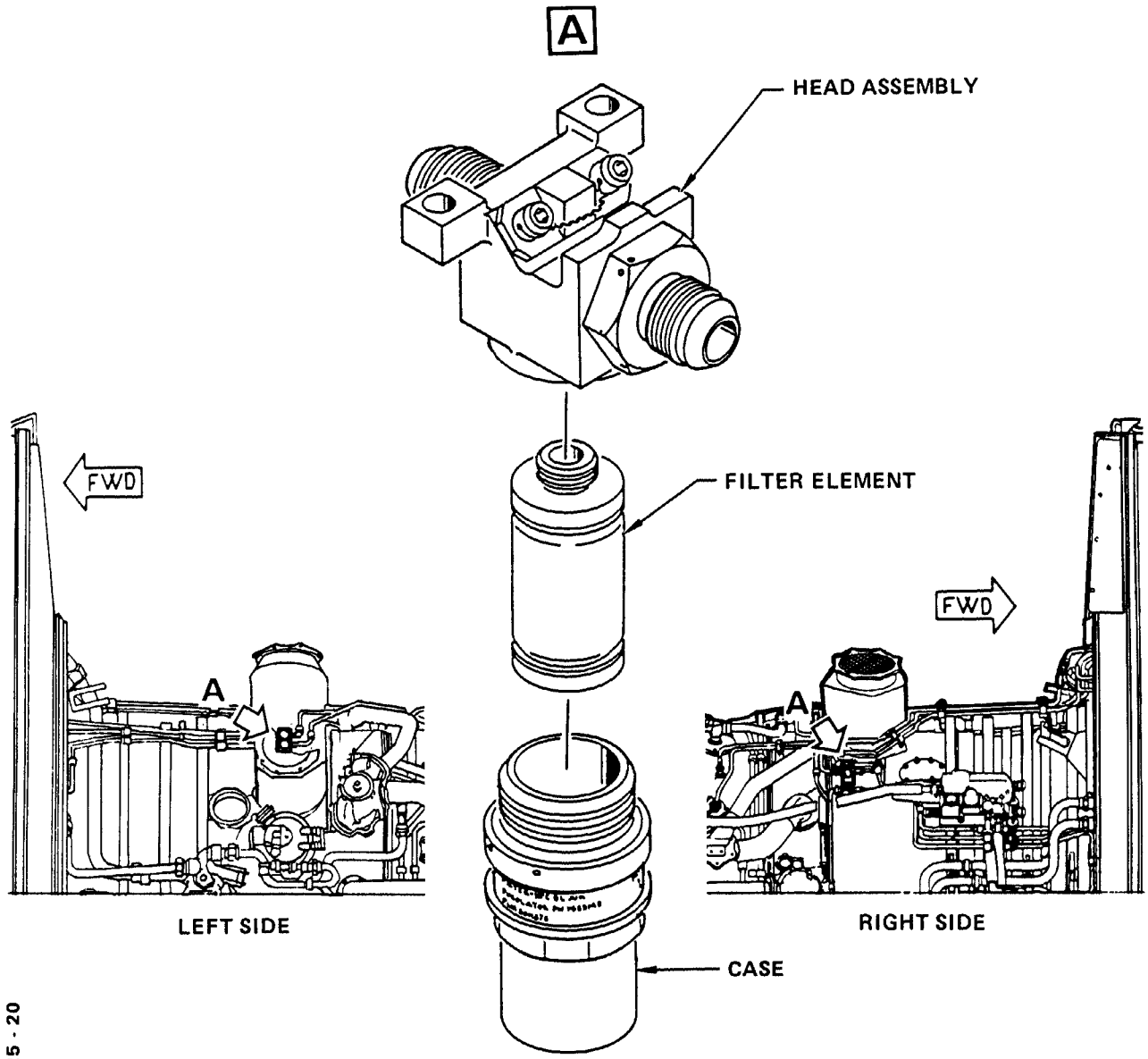
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



HPC Secondary Flow Control Valve Filter (Left)
Figure 401



HPC Secondary Flow Control Valve Filter (Right)
Figure 402



HPC Secondary Flow Control Valve Filter Element
Figure 403

HPC SECONDARY FLOW CONTROL VALVE FILTER - INSPECTION/CHECK

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

1. Equipment and Materials

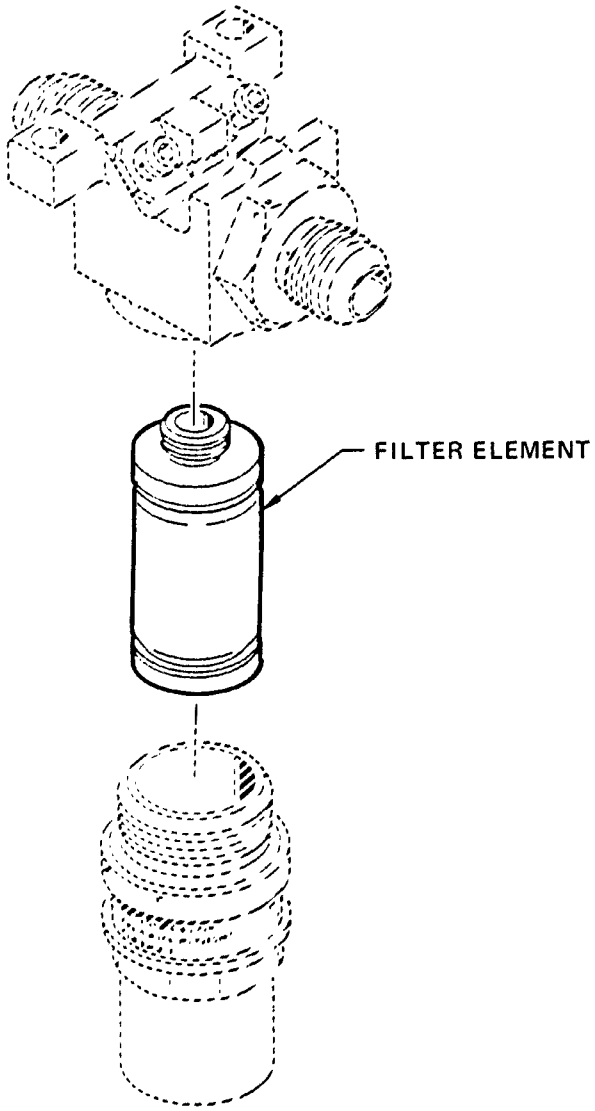
ITEM	DESIGNATION
Referenced Procedures	
- 75-33-02, P. Block 401	HPC Secondary Flow Control Valve Filter
- 75-33-02, P. Block 701	HPC Secondary Flow Control Valve Filter

2. Procedure

A. Job Set-Up
(1)Remove filter element (Ref. 75-33-02, P. Block 401).

B. Inspection (Ref. Fig. 601)
(1)Inspect filter element for evidence of an accumulation of contamination.
(2)Clean filter element (Ref. 75-33-02, P. Block 701).

C. Close-Up
(1)Install filter element (Ref. 75-33-02, P. Block 401).



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HPC Secondary Flow Control Valve Filter Element
Figure 601

HPC SECONDARY FLOW CONTROL VALVE FILTER - CLEANING/PAINTING

NOTE : This procedure is only available on aircraft equipped with PHASE I configured engines.

1. Equipment and Materials

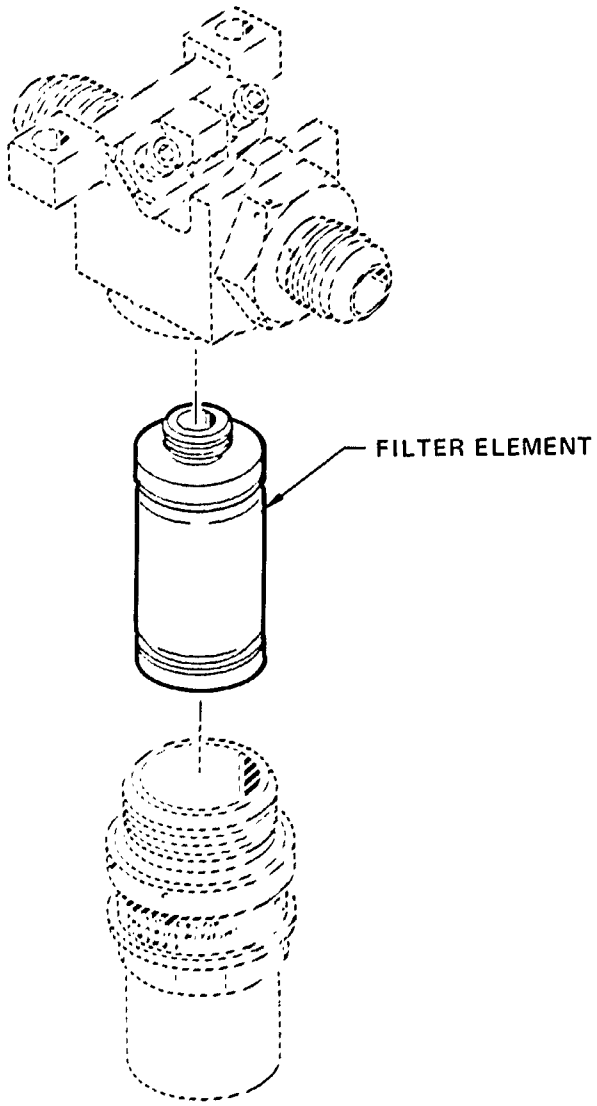
ITEM	DESIGNATION
A. Material No.P05-005	Special Materials (Ref. 70-00-00)
B. Material No.P05-058	Special Materials (Ref. 70-00-00)
C. Material No.P11-004	Cleaning Agents (Ref. 70-00-00)
Referenced Procedure	
- 75-33-02, P. Block 401	HPC Secondary Flow Control Valve Filter

2. Procedure

A. Job Set-Up
(1)Remove filter element (Ref. 75-33-02, P. Block 401).

B. Cleaning (Ref. Fig. 701)
(1)Clean filter element with Material No.P11-004. Use Material No.P05-058 to remove stubborn accumulations of contamination.
(2)Dry filter element with Material No.P05-005 or filtered, moisture free compressed air at 20 psig (1.38 bar) maximum.
(3)Repeat cleaning procedure if any contaminants remain in filter element.
(4)If filter element remains contaminated after repeated cleaning, replace filter element.

C. Close Up
(1)Install filter element (Ref. 75-33-02, P. Block 401).



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HPC Secondary Flow Control Valve Filter Element
Figure 701

HPC SECONDARY FLOW CONTROL VALVE, TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID - REMOVAL/INSTALLATION

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Gaskets
C.	Access Platform
D.	Torque Wrench
E.	Caps
F.	Protective Covers
G.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
H.	Sharp Knife
I. Material No.P03-001	Oils (Ref. 70-00-00)
R J. Material No.P06-054	Lubricants (Ref-70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69

(2)Install access platform.

(3)Open left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(4)Install the fan exit liner segment (inner rear) that is at 10 o'clock (Ref. 72-23-05, P. Block 401).

B. Removal (Ref. Fig. 401)

(1)Disconnect W3P12 harness connector from solenoid. Install protective closures on harness and solenoid connectors.

(2)Remove lockwire from three tube nuts on rear of solenoid and disconnect

tube nuts from solenoid.

(3)Remove four bolts securing solenoid and bracket to case. Remove solenoid from under bracket and from engine.

NOTE : If necessary, loosen clamp bolt securing tube to bracket to gain clearance for solenoid removal.

(4)If solenoid is to be replaced, comply with the following :

(a)Remove three adapters and gaskets from rear of solenoid.

(b)Remove lockwire and remove two caps from adapters on top of valve. Remove two adapters and gaskets from top of solenoid.

(c)Install protective covers to all openings on valve solenoid.

C. Installation (Ref. Fig. 401)

(1)If new solenoid is being installed comply with the following :

(a)Remove protective covers from all openings on solenoid.

(b)Install two adapters with gaskets, threads lubricated with Material No.P03-001, to two openings on top of solenoid. TORQUE adapters to between 65 and 75 lbf.in. (0.73 and 0.85 m.daN).

(c)Install two caps, threads lubricated with Material No.P03-001, to above adapters. TORQUE caps to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN). Wirelock caps.

(d)Install three adapters, larger adapter in center, to three ports on rear of solenoid with gaskets, threads lubricated with Material No.P03-001. TORQUE center adapter to between 150 and 170 lbf.in. 1.69 and 1.92 m.daN) and two outer adapters to between 110 and 120 lbf.in. (1.24 and 1.36 m.daN).

(2)Position solenoid to intermediate case and under bracket, at approximately the 10 o'clock position, with three adapters pointing rearward and rear lugs on solenoid rearward of lugs on case. Secure with four bolts, threads lubricated with Material No.P03-001. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

NOTE : If clamp bolt was loosened to gain clearance for solenoid removal, tighten and TORQUE clamp bolt to between 36 and 40 lbf. in. (0.40 and 0.45 m.daN).

R (3)Lubricate threads of adapter with Material No.P06-054 and install supply tube assembly to center adapter on rear of solenoid. TORQUE tube nut to between 225 and 250 lbf.in. (2.54 and 2.82 m.daN).

(4)Lubricate upper rear adapter on solenoid with Material No.P03-001 and install signal tube assembly to adapter. TORQUE tube nut to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

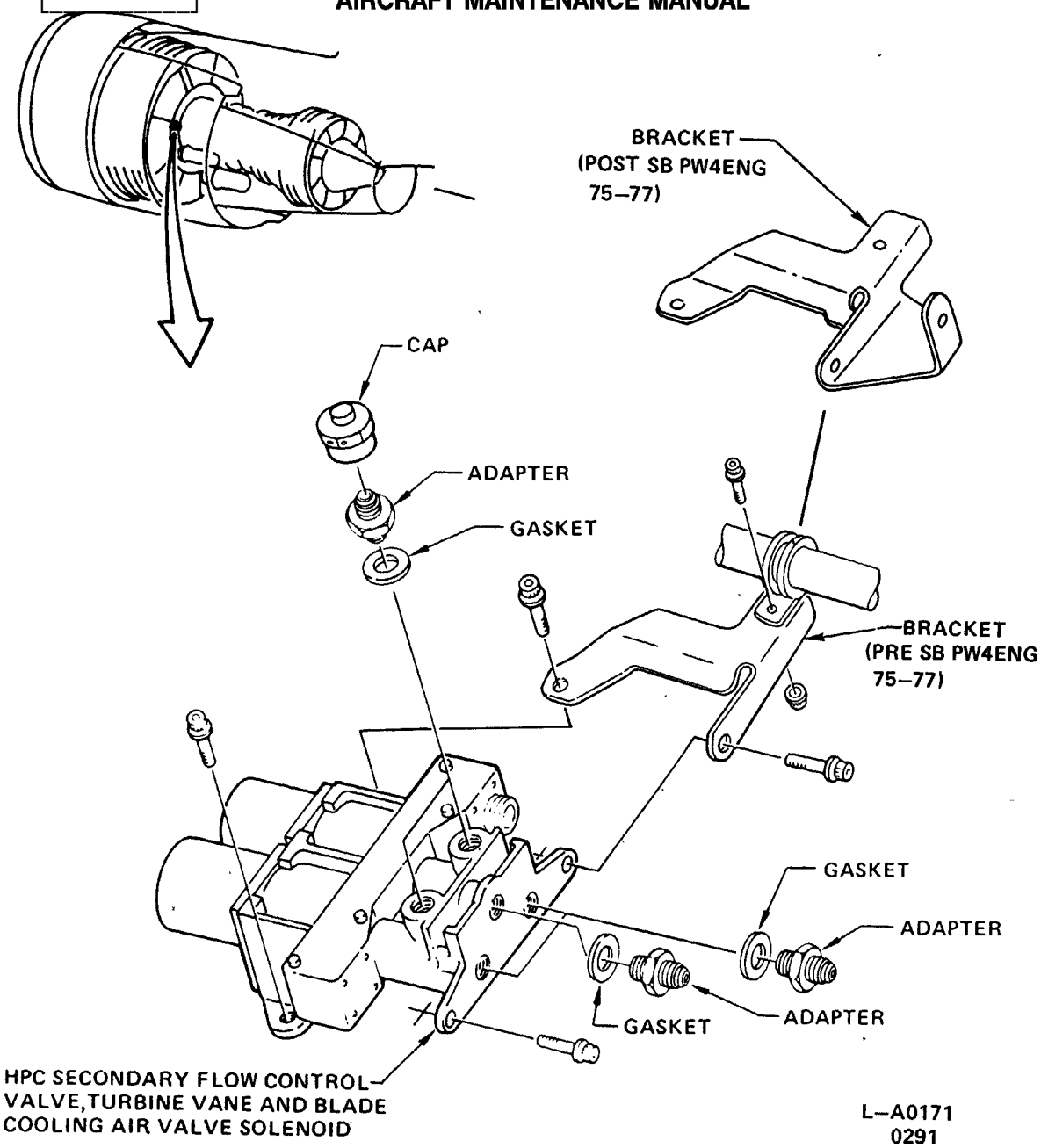
(5)Lubricate lower rear adapter on valve solenoid with Material No.P03-001, and install signal tube assembly to adapter. TORQUE tube nut to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

(6)Wirelock all three of the above tube nuts.

(7)Remove protective closures.

(a)Connect W3P12 harness connector to solenoid.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.



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HPC Secondary Flow Control Valve, Turbine Vane
and Blade Cooling Air Valve Solenoid
Figure 401

D. Close-Up and Test

(1)Install the fan exit liner segment (inner rear) that you removed (Ref. 72-23-05, P. Block 401).

(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(3)Remove access platform.

(4)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(5)Remove safety clips and tags and close circuit breakers : 19KS, 21KS, 18KS, 20KS.

(6)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

HPC SECONDARY FLOW CONTROL VALVE, TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID - ADJUSTMENT/TEST

1. Functional Check of TCA Solenoid

A. Equipment and Materials

ITEM	DESIGNATION
A.	Lockwire
B.	Filtered Shop Air or Other Source
C.PWA86621	Reducer, Adapter
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors
- 75-24-01, P. Block 501	Turbine Vane and Blade Cooling Air Valve

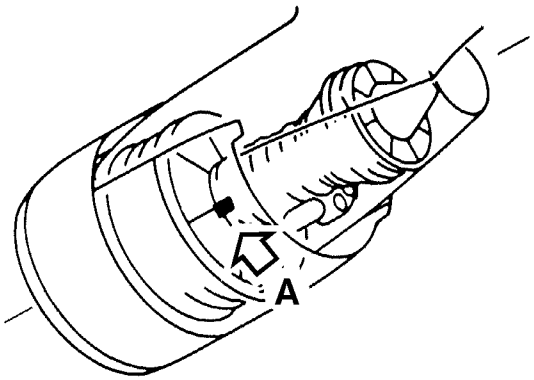
B. Job Set-Up

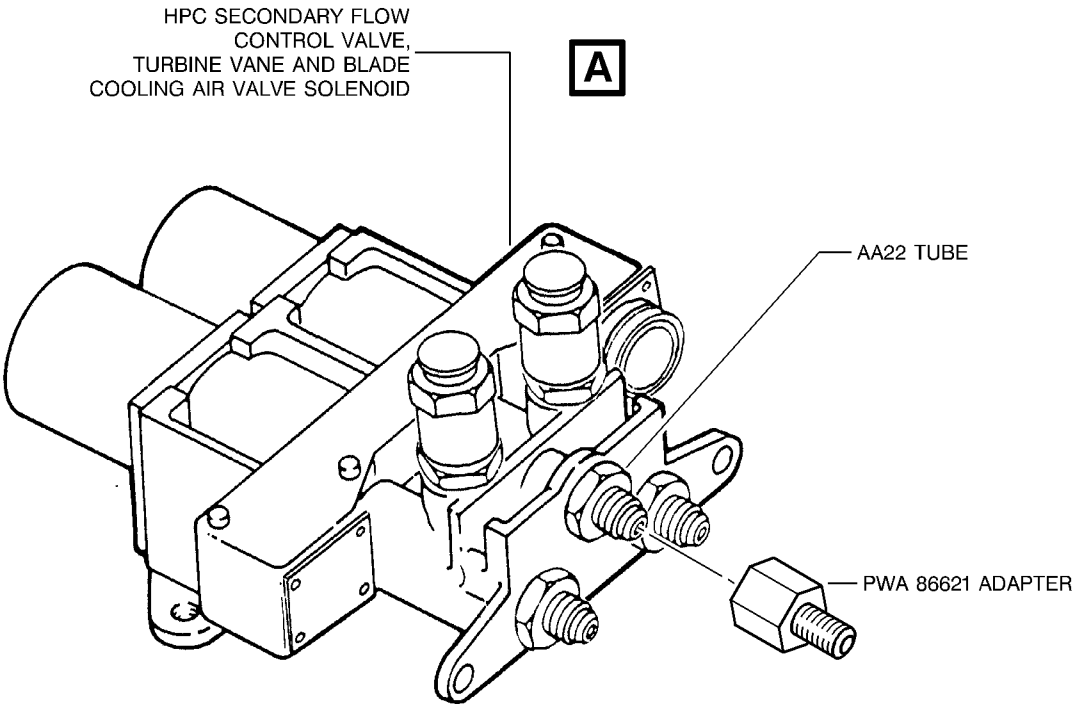
(1)Open, fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

C. Functional Inspection of TCA Solenoid Valve (Ref. Fig. 501)

(1)Visually inspect the position indication pins on both TCA valves (Ref. 75-24-01, P. Block 501).
NOTE : The indicators must be popped up.
(2)Loosen the clamp closest to the HPC secondary flow control, turbine vane and blade cooling air valve solenoid (solenoid valve 10:00 position) on the bleed and HPC drum air valve supply tube (AA22). Do not totally remove the bolt/nut.
(3)Remove lockwire from the AA22 tube B-nut (center B-nut on the solenoid valve) and disconnect the AA22 tube B-nut.
(4)Install PWA 86621 Reducer Adapter on the center fitting on the solenoid valve and connect a flex hose to the reducer adapter (Ref. Fig. 501).
(5)Pressurize the solenoid valve to 100 - 500 PSI (689.5 - 3447.4 kPa) using filtered shop air or a portable pressure bottle.
(6)While the solenoid valve is pressurized, inspect the position indication pins on the TCA valves again to verify that they have not moved down.
NOTE : The pin must stay in the popped up position with or without pressure applied.
(7)If the position indication pins moved down, the TCA solenoid valve has failed/stuck in the energized (open) position. The TCA solenoid valve must be replaced before the engine can re-enter service (Ref. 75-33-03, P. Block 401).
Replace the HPT second stage airseal (Ref. PW Engine Manual) (Within 50 hours or 5 cycles whichever occurs first to allow for return to a facility capable of performing the necessary maintenance).
(8)Remove the flex line and the adapter.
(9)Lubricate threads of adapter with Material No.P06-003 and install supply tube assembly to center adapter on rear of solenoid. TORQUE tube nut to between 225 and 250 lbf.in. (2.54 and 2.82 m.daN).
(10)Tighten the clamp on the AA22 closest to the solenoid valve (10:00 position) on the AA22.

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).





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Location of the Solenoid
Figure 501

HPC SECONDARY FLOW CONTROL VALVE, IDGS AIR/OIL HEAT EXCHANGER VALVE OVERRIDE SOLENOID - REMOVAL/INSTALLATION

NOTE : This procedure is available on aircraft equipped with PHASE I configured engines.

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Gaskets
D.	Torque Wrench
E.	Caps
F.	Protective Covers
G.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
H. Material No.P03-001	Oils (Ref. 70-00-00)
R I. Material No.P06-054	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69

(2)Install access platform.

(3)Open left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(4)Remove the fan exit liner segment (inner rear) that is at 1 o'clock (Ref. 72-23-05, P. Block 401).

B. Removal (Ref. Fig. 401)

(1)Disconnect W1P10 and W1P11 harness connectors from solenoid.

(2)Remove lockwire from two tube nuts on rear of solenoid and disconnect tubes.

(3)Remove lockwire from pressure switch tube nuts. Disconnect and remove

tube. Install protective closures on tube.

(4)Remove four bolts securing solenoid and pressure switch bracket to case. Remove bracket and solenoid from engine and install protective closures.

(5)If solenoid is to be replaced comply with the following :

(a)Remove two adapters and one plug from rear of solenoid.

(b)Remove lockwire and remove cap from adapter on top of solenoid. Remove two adapters from top of solenoid.

(c)Install protective covers to all openings on solenoid.

C. Installation (Ref. Fig. 401)

(1)If new solenoid is being installed comply with the following :

(a)Remove protective covers from all openings on solenoid.

(b)Install two adapters with gaskets, threads lubricated with Material No.P03-001, to two openings on top of solenoid. TORQUE adapters to between 65 and 75 lbf. in. (0.73 and 0.85 lbf.in.).

(c)Install cap, threads lubricated with Material No.P03-001, to right adapter. TORQUE cap to between 90 and 100 lbf.in (1.02 and 1.13 m.daN).

(d)Install two adapters, larger adapter in center port, and smaller adapter in right port on rear of solenoid with gaskets, threads lubricate with Material No.P03-001. TORQUE larger adapter to between 150 and 170 lbf.in. (1.69 and 1.92 m.daN) and smaller adapter to between 110 and 120 lbf.in. (1.24 and 1.36 m.daN).

(e)Install plug with gasket, threads lubricated with Material No.P03-001, to left port on rear of solenoid.
TORQUE plug to between 110 and 120 lbf.in. (1.24 and 1.36 m.daN).

(2)Position solenoid to intermediate case, at approximately 1 o'clock position, with two adapters rearward and rear lugs on solenoid rearward of lugs on case.
Position switch and bracket assembly to solenoid and install four bolts, threads lubricated with Material No.P03-001, securing bracket and solenoid to intermediate case. TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

R (3)Lubricate threads of adapter with Material No.P06-054 and install supply tube nut to center adapter on rear of solenoid. TORQUE tube nut to between 225 and 250 lbf.in. (2.54 and 2.82 m. daN).

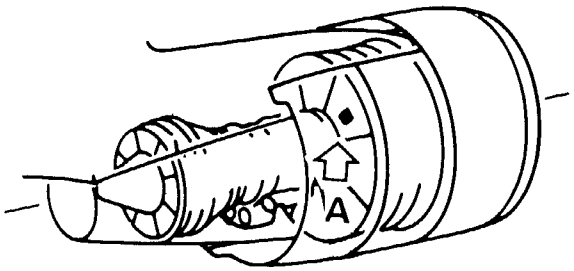
(4)Lubricate lower rear adapter on solenoid with Material No.P03-001, and install air solenoid signal tube nut to adapter. TORQUE tube nut to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN). Secure tubes and plug with lockwire.

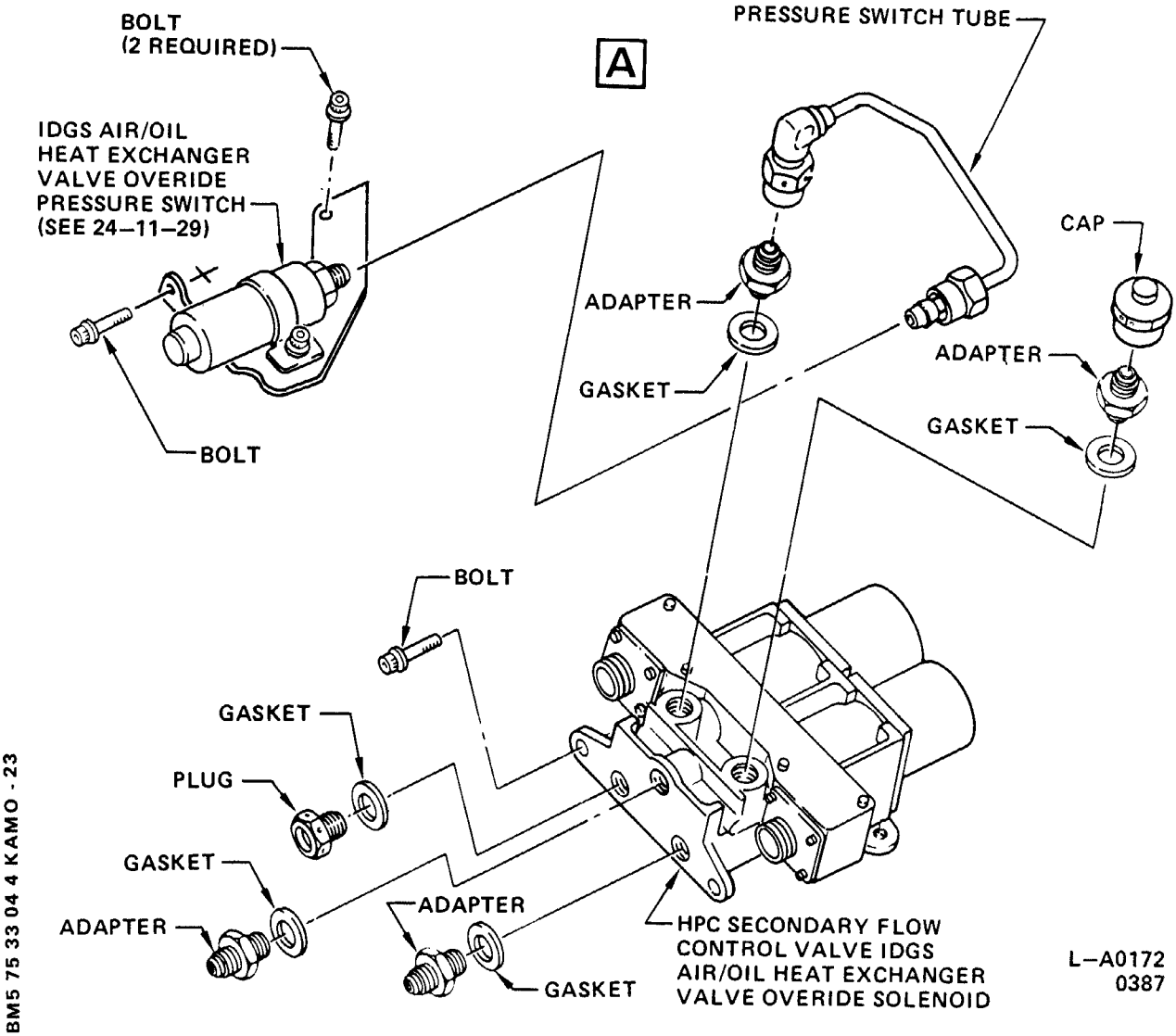
(5)Install pressure switch tube assembly.

(a)Lubricate threads at elbow end of tube with Material No.P03-001 and
R threads at straight end with Material No.P06-054 and install tube to engine.

(b)TORQUE elbow end to solenoid adapter to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN). TORQUE straight end to pressure switch to between 65 and 75 lbf.in. (0.73 and 0.85 m.daN). Secure both ends of tube and cap with lockwire.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A





HPC Secondary Flow Control Valve, IDGS Air/Oil
Heat Exchanger Valve Override Solenoid
Figure 401

DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(6)Connect W1P10 harness connector to solenoid (Ref. 70-00-00, P. Block 201).

(7)Connect W1P11 harness connector to remaining connector on solenoid (Ref. 70-00-00, P. Block 201).

D. Close-Up and Test

(1)Install the fan exit liner segment (inner rear) that you removed (Ref. 72-23-05, P. Block 401).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Remove access platform.
(4)Close thrust reverser and left fan cowl doors (Ref. 71-13-00, P. Block 301).
(5)Remove safety clips and tags and close circuit breakers : 19KS, 21KS, 18KS, 20KS.
(6)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

HPC NINTH STAGE START/STABILITY (2.9) BLEED SYSTEM DESCRIPTION AND OPERATION

1. General

The two 9th stage compressor bleeds, (HPC 9th stage start/stability (2.9) bleed system) provide increased compressor stability during starting and transient operation. The bleeds are controlled as a function of high rotor speed (N2) and engine inlet total temperature (T2).

2. Compoment Location

(Ref. Fig. 001)

FIN	FUNCTIONAL DESIGNATION	PANEL	ZONE	ACCESS DOOR	ATA REF.
	VALVE - (2.9) BLEED, NINTH STAGE START/STABILITY		453	435AL	75-35-03
			463	445AL	75-35-03
	VALVE - (2.9) BLEED, NINTH STAGE START		454	436AR	75-35-03
			464	446AR	75-35-03
	BELLOWS SEAL - (2.9) BLEED VALVE		453	435AL	75-35-04
			454	436AR	75-35-04
			463	445AL	75-35-04
			464	446AR	75-35-04
	SOLENOID - START BLEED/STABILITY BLEED		452	436AR	75-35-05
			462	446AR	75-35-05
	RELAY VALVE - START BLEED PNEUMATIC		452	436AR	75-35-06
			462	446AR	75-35-06

3. Description

The Full Authority Digital Engine Control (FADEC) interfaces with the compressor bleed valves through two redundant coil solenoid valve assemblies.

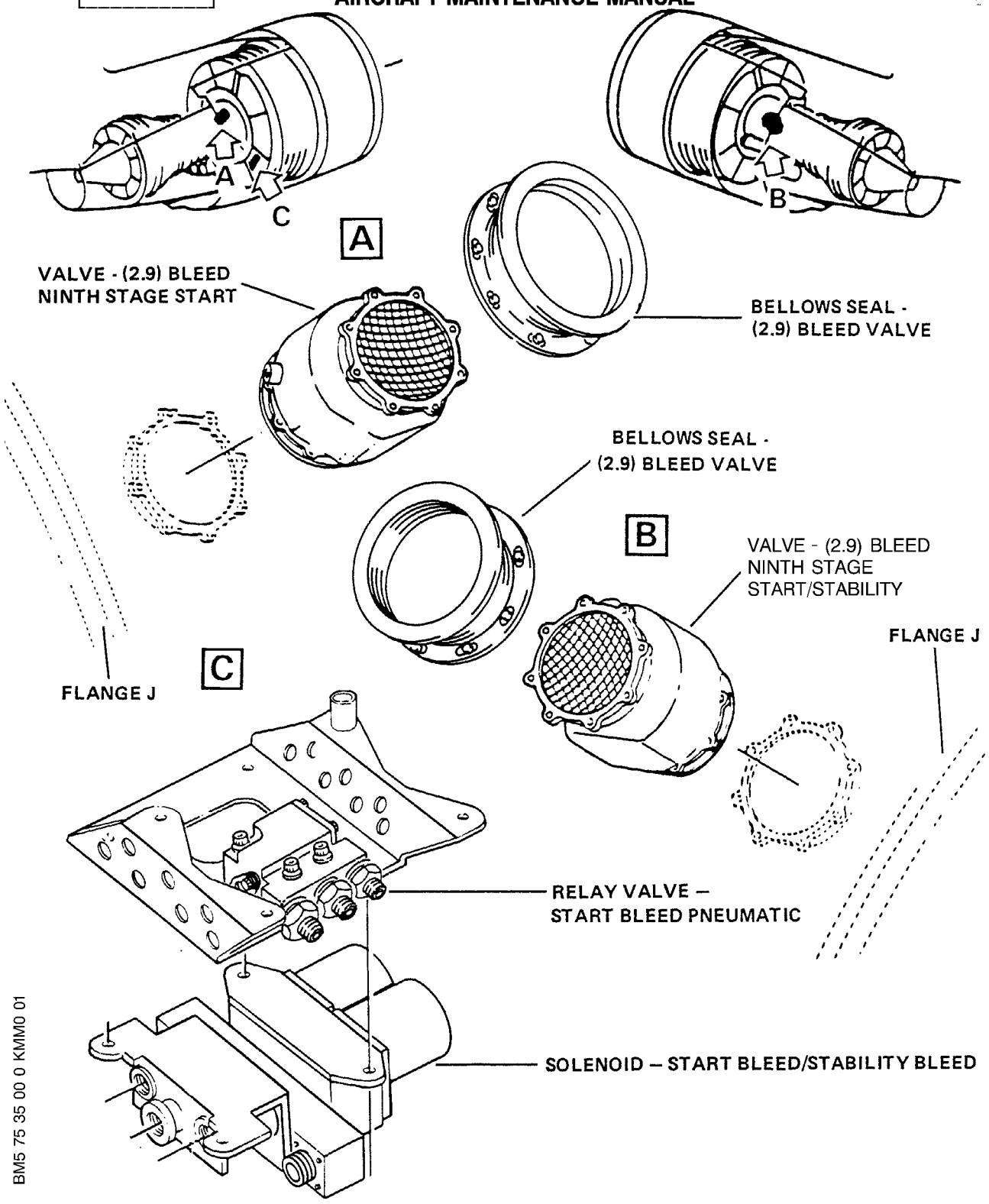
The two solenoid valves are remotely mounted as part of a single assembly. The compressor bleed valves position is sensed by two thermocouple probes and feedback to the FADEC for maintenance data.

4. Operation (Ref. Fig. 002, 003)

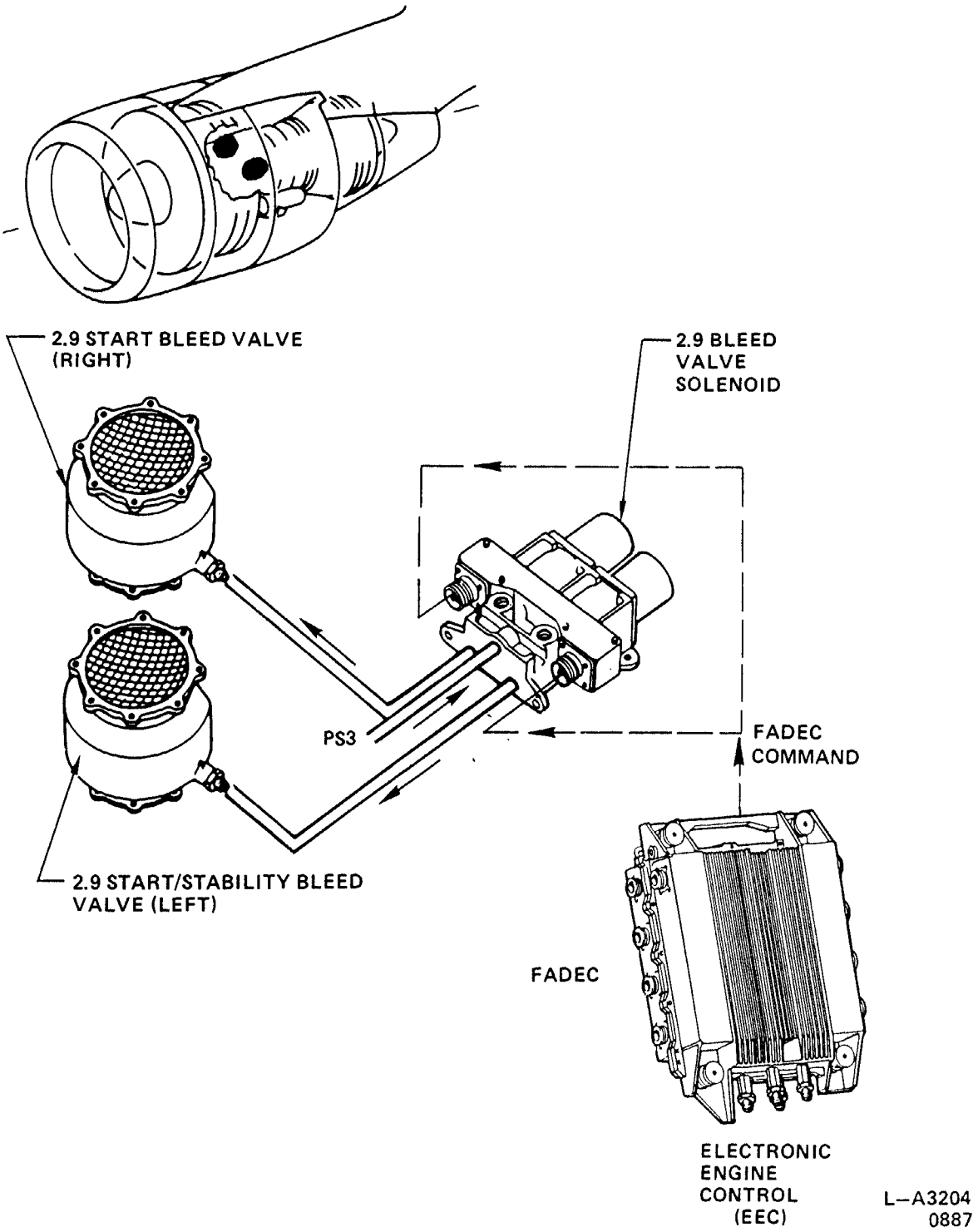
During most of the engine start cycle, both 9th stage compressor bleeds are commanded open, venting 9th stage compressor air into the fan stream. Both bleeds close at approximately two percent N2 below idle. The start 2.9 bleed (right bleed), remains closed during all engine operation. The stability 2.9 bleed (left bleed) is opened for a maximum of two seconds if the engine is decelerated to below eighty-one percent N2 and is also opened if an impending engine surge is detected.

The 9th stage bleed valves are two position (open/closed) poppet design valves which are spring loaded open. The poppets are closed by compressor discharge pressure routed through the FADEC controlled solenoid valves.

5. Ninth Stage Start/Stability (2.9) Bleed Valve (Ref. Fig. 004, 005)



HPC Ninth Stage Start/Stability (2.9) Bleed System-
Component Location
Figure 001



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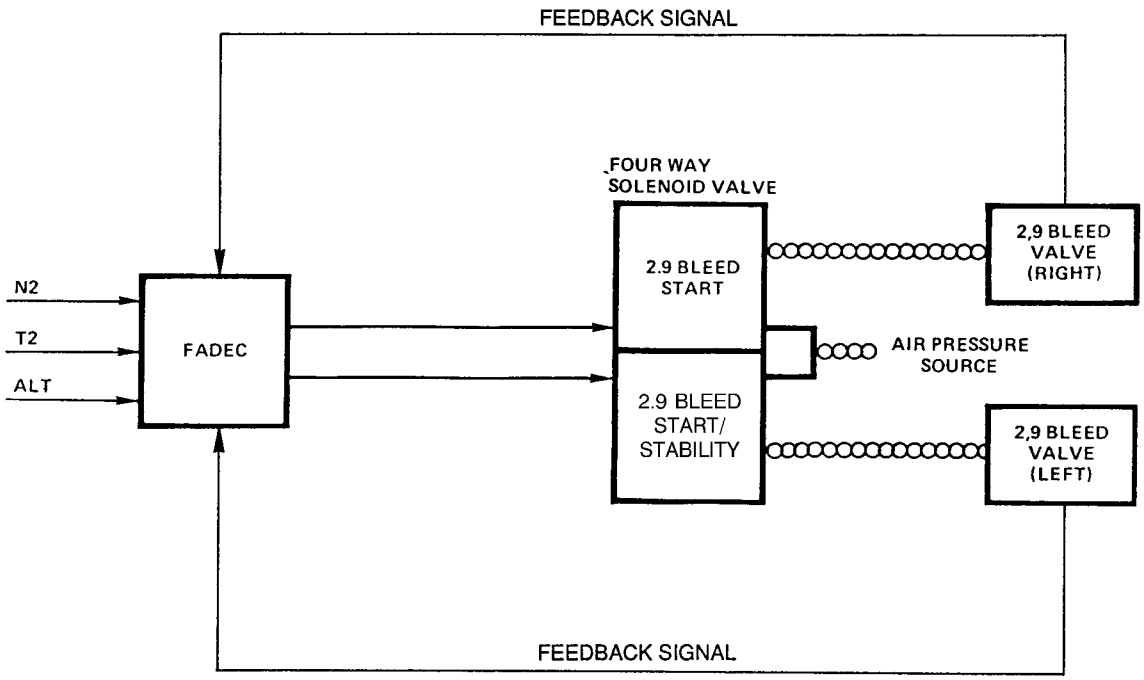
HPC 9th Stage Start/Stability (2.9) Bleed System
Figure 002



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HPC 9th Stage Start/Stability (2.9) Bleed Control
Figure 003

A. The 9th stage start/stability (2.9) bleed valve is used to vent 9th stage compressor air overboard to protect engine against surge during engine starting and during some transient operations.

B. The start bleed system consists of two valves located at 10 and 1 o'clock positions on high compressor. Each valve is a fail-safe (spring loaded) open piston valve assembly.
Valves are pneumatically actuated to the closed position by applying compressor discharge (15th stage) air to one side of valve piston through 9th stage start (2.9) bleed valve solenoid.

6. Start/Stability Bleed Valve Solenoid (Ref. Fig. 006)

A. Description
(1) The bleed valve solenoid valve has one common inlet port, two outlet ports, two vent ports, two solenoids, two electrical connectors, and two threaded test ports for testing the valve on the aircraft engine. The valve consists of two sections which actuate and control airflow to two external bleed valves. Fifteenth stage air is the muscle pressure source for the valve. The solenoids each have two coils, either of which can energize the solenoid.

B. Operation
(1) The No. 1 solenoid controls the supply of 15th stage muscle air pressure to the left ninth stage start (2.9) bleed valve as well as the inlet port of the No. 2 solenoid. The No. 2 solenoid controls the supply of 15th stage muscle air pressure to the right ninth stage stability (2.9) bleed valve. Solenoid No. 1 is open when de-energized while solenoid No. 2 is closed when de-energized. The inlet port of solenoid No. 2 is only pressurized when solenoid No. 1 is de-energized.

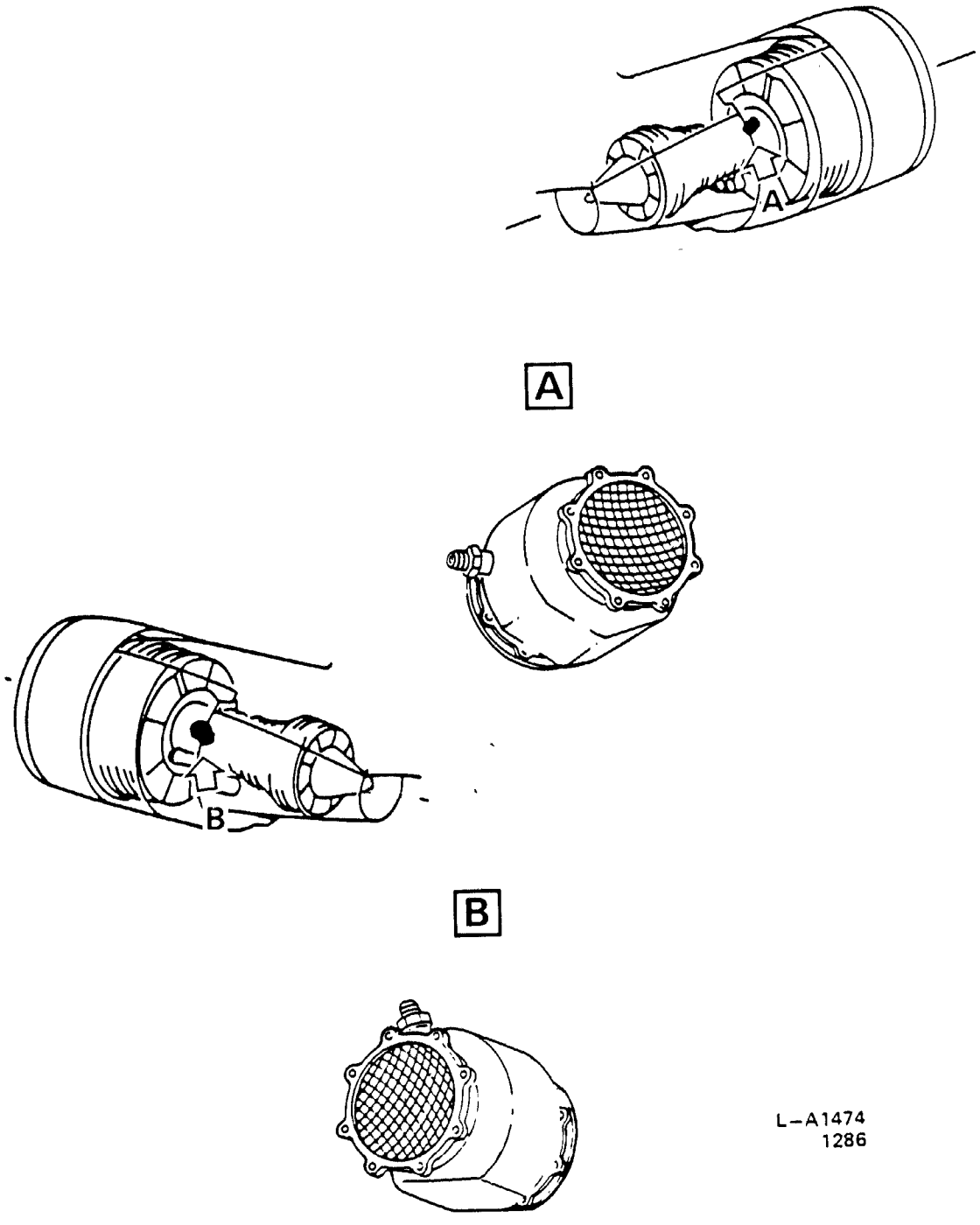
7. Stability Bleed Pneumatic Relay Valve (Ref. Fig. 007)

A. Description
The stability pneumatic relay valve has three threaded ports (inlet, outlet, and servo) and one screened vent port. The relay valve is mounted at approximately 5 o'clock position in the rear of the intermediate case assembly. It is attached to a support with three bolts and three nuts.

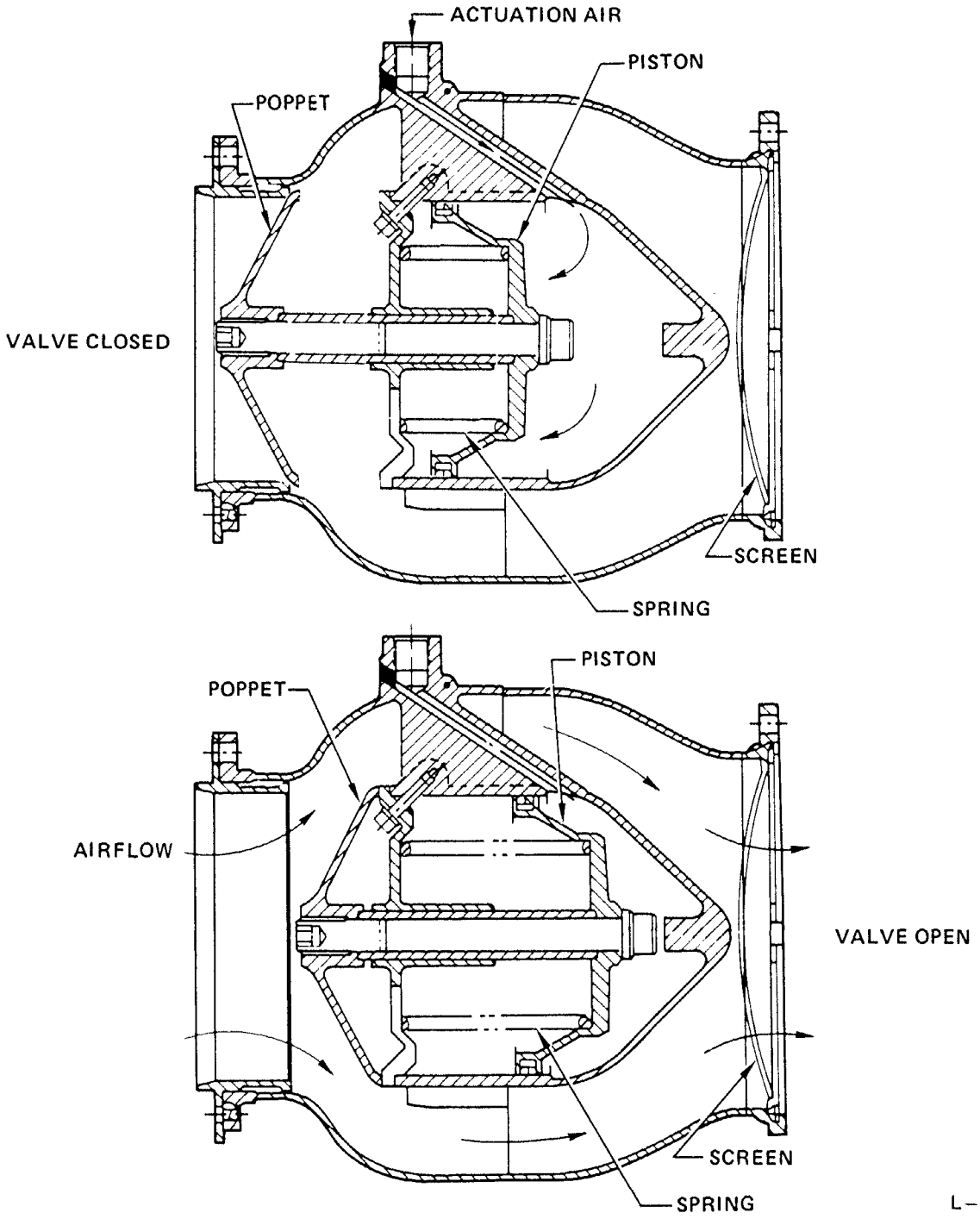
B. Operation
The purpose of the stability pneumatic relay valve is to ensure rapid opening of the left 2.9 bleed valve (start/stability).
When the servo pressure to the relay valve is interrupted by the 2.9 bleed valve solenoid, the relay valve cuts off and vents muscle pressure (PS3) which was holding the left bleed valve closed.

8. 2.9 Bleed Valve Thermocouple Probe (Ref. Fig. 008)

A. The 2.9 bleed valve thermocouple probe is a thermoelectric device that measures temperature of the air in each of the 2.9 bleed valves.



Ninth Stage Start/Stability (2.9) Bleed Valve
Figure 004



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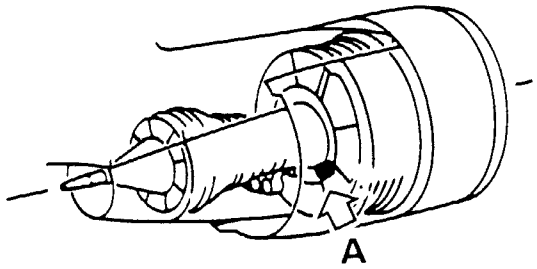
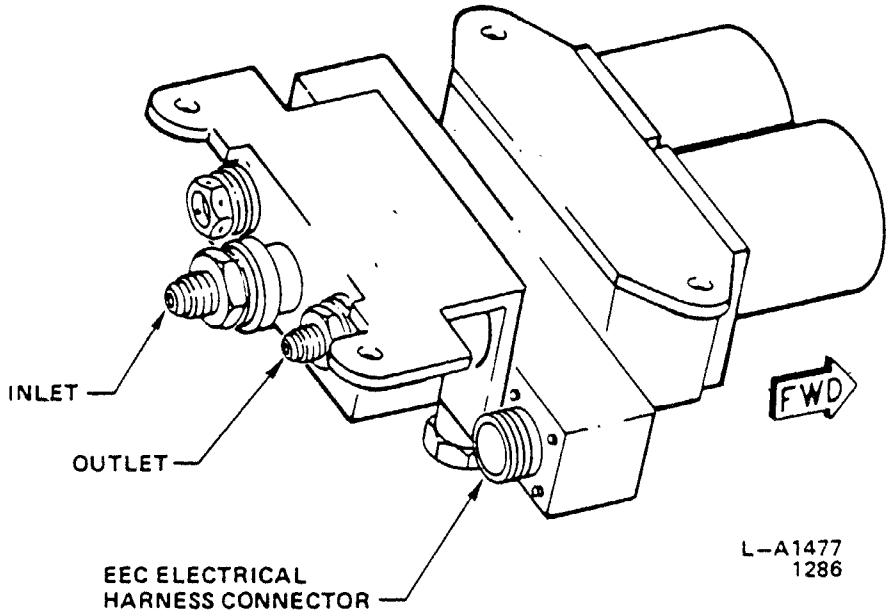
Ninth Stage Start/Stability (2.9) Bleed Valve Flow Schematic
Figure 005



A



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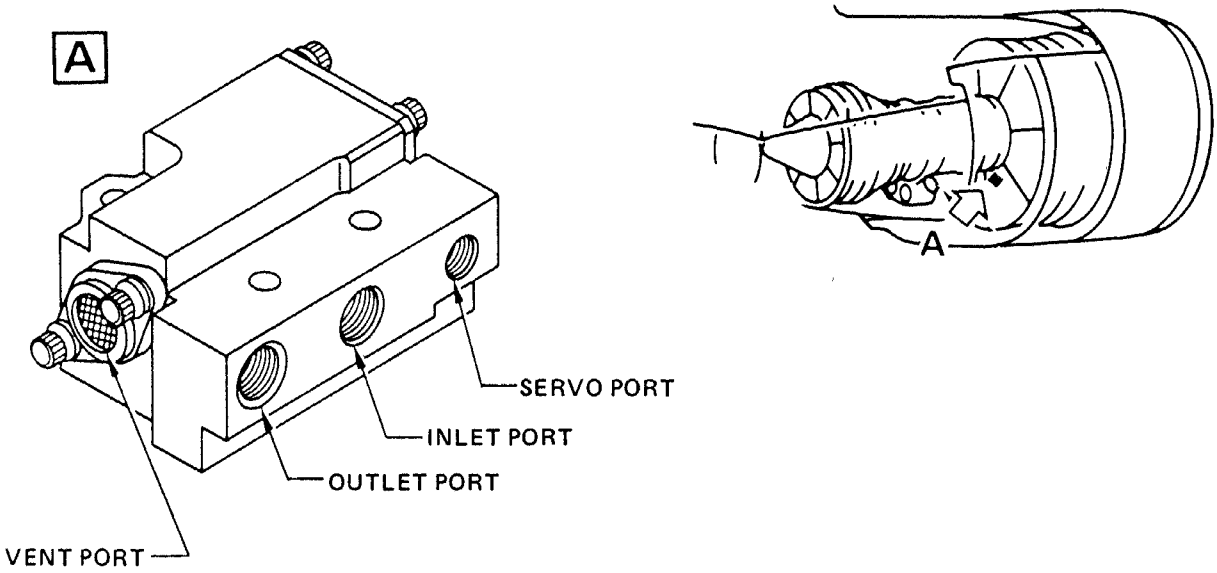
Start/Stability Bleed Valve Solenoid
Figure 006



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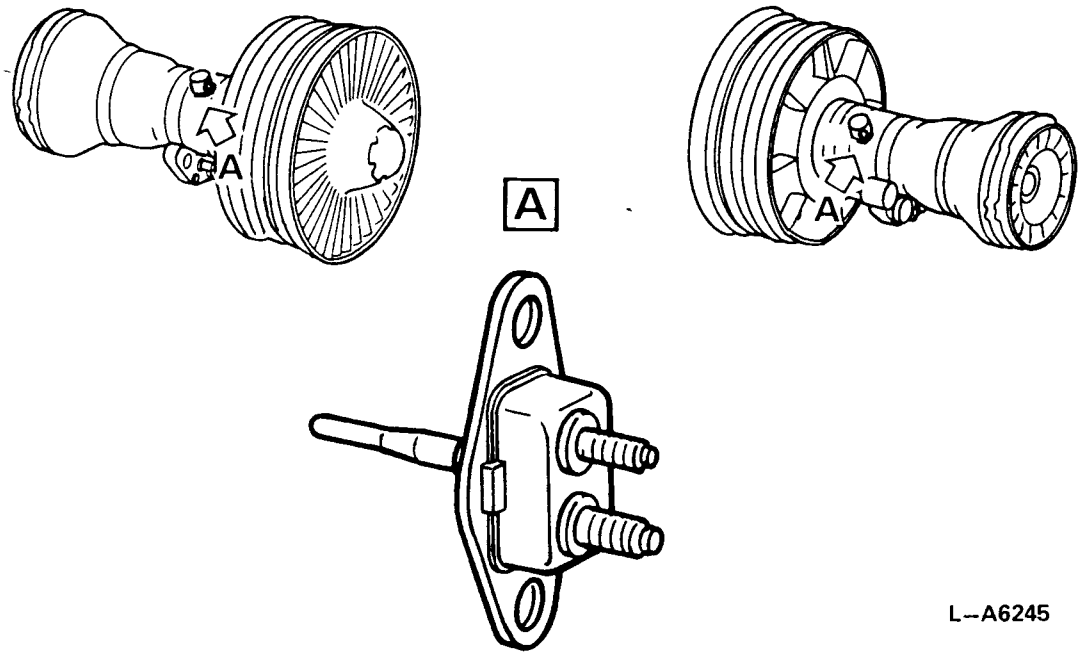
Stability Bleed Pneumatic Relay Valve
Figure 007

B. There are two 2.9 bleed valve thermocouple probes. One probe is located in each 2.9 bleed valve (right and left). The thermocouple temperature measurements (voltages) are sent through the FADEC wiring harnesses to the FADEC. Together the probe and the FADEC monitor the airflow in each bleed valve to determine if each valve is open or closed. The FADEC will then send information to the aircraft maintenance system of an improper bleed valve opening or failed thermocouple probe.



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2.9 Bleed Valve Thermocouple Probe
Figure 008

NINTH STAGE START/STABILITY (2.9) BLEED VALVE - REMOVAL/INSTALLATION

1. Bleed Valve

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Gaskets
D.	Protective Closures
E.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
F. PWA85436	Adapter Torque
G.	Torque Wrench
H. Material No.P03-001	Oils (Ref. 70-00-00)
R I. Material No.P06-054	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Standard Practices - General
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General
- 75-35-04, P. Block 401	2,9 Bleed Valve Bellows Seal
- 75-35-07, P. Block 401	2.9 Bleed Valve Thermocouple Probe

B. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.
(3)Remove bleed valve bellows seal (Ref. 75-35-04, P. Block 401).
(4)Remove the 2.9 bleed valve thermocouple probe (Ref. 75-35-07, P. Block 401).

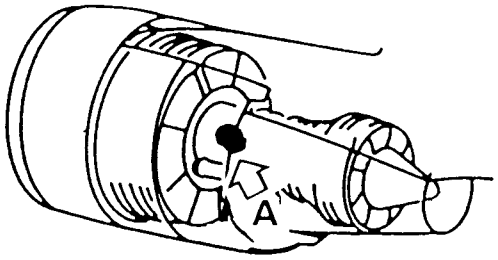
C. Removal
(1)Upper left 2.9 bleed valve (Ref. Fig. 401)
(a)Remove lockwire and disconnect bleed valve supply manifold from 2.9 bleed valve, located at 10 o'clock position on left side of HPC rear case.
(b)Using PWA85436 Torque Adapter, remove eight bolts securing bleed valve to engine and remove valve.
NOTE : You can apply penetrant oil as per SPOP 427 (Ref. 70-00-00, P. Block 201) to make the removal of the bolt(s) easier.
(c)Remove gasket from boss and discard. Install protective closure.
(d)Remove tube adapter and gasket from bleed valve. Install protective closures on valve.
(e)If equipped, remove the bolts and cover from the boss located on the side of the bleed valve. Install a protection cover on the bleed valve.
(2)Upper right 2.9 bleed valve (Ref. Fig. 402)
(a)Remove lockwire and disconnect bleed valve supply manifold from side of 2.9 bleed valve, located at 1 o'clock position on right side of HPC rear case.

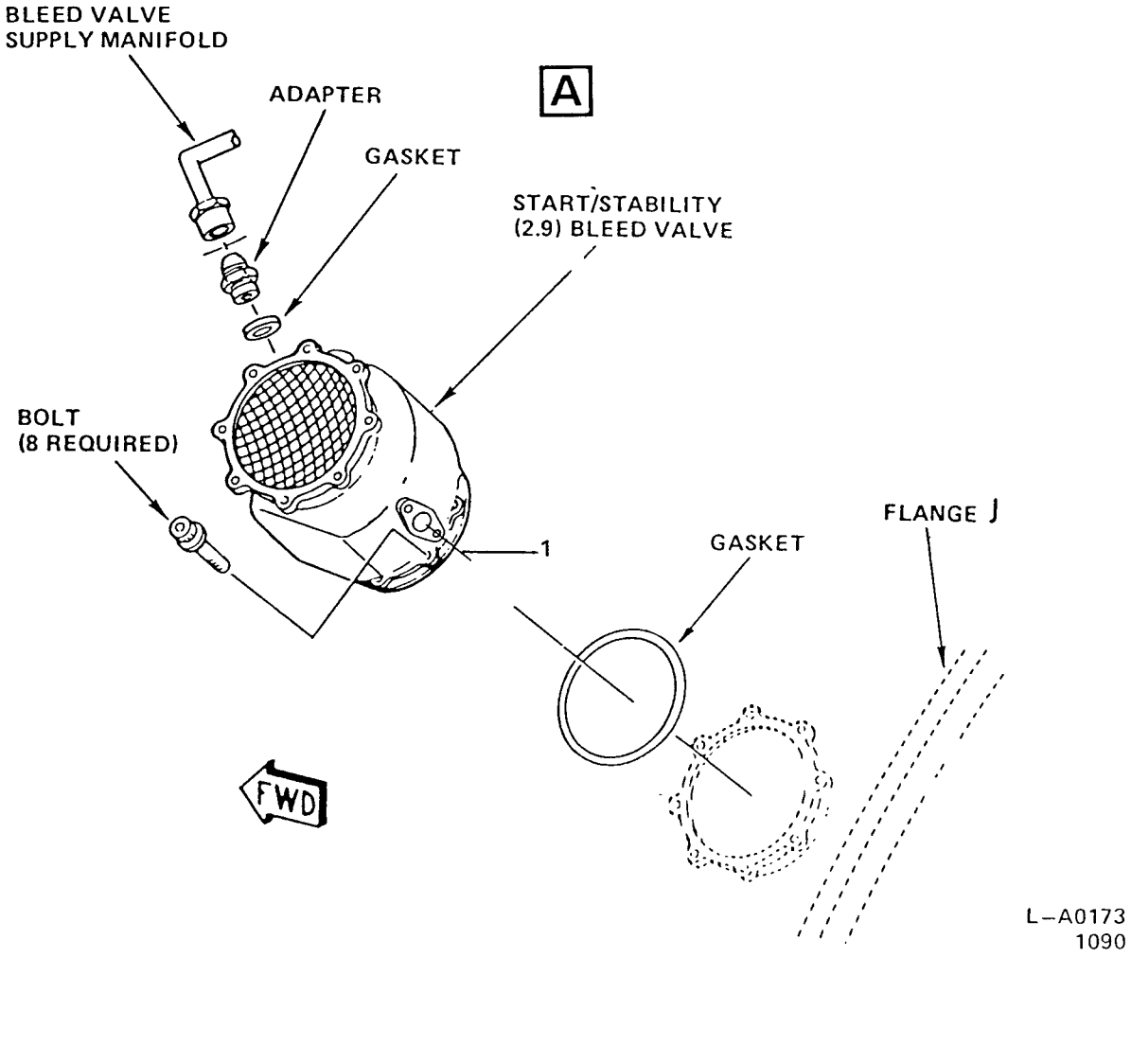
(b)Using PWA85436 Torque Adapter remove eight bolts securing bleed valve to engine and remove valve.
NOTE : You can apply penetrant oil as per SPOP 427 (Ref. 70-00-00, P. Block 201) to make the removal of the bolt(s) easier.
(c)Remove gasket from boss and discard. Install protective closure.
(d)Remove tube adapter and gasket from bleed valve. Install protective closures on valve.
(e)Install a protective closure on the boss located on the side of the bleed valve (1).

D. Installation
(1)Upper left 2.9 bleed valve (Ref. Fig. 401)
(a)Install gasket on tube adapter. Lubricate adapter threads with Material No.P03-001.
(b)Remove protective closure and install adapter in boss on 2.9 bleed valve. Tighten and TORQUE adapter to between 110 and 120 lbf. in. (1.24 and 1.36 m.daN).

(c)Remove protective closure from boss on left side of HPC rear case at approximately 10 o'clock position and install gasket in groove of boss.
CAUTION : WHEN USING PWA85436 TORQUE ADAPTER THE ACTUAL TORQUE WRENCH READING WILL BE LESS THAN THAT STATED BELOW.
(d)Remove protective closure from bleed valve and install on boss with threaded adapter pointing up and forward to align adapter with tube. Secure bleed valve with eight bolts, threads lubricated with Material No.P03-001. Using PWA85436 Torque Adapter tighten and TORQUE bolts to between 85 and 95 lbf. in. (0.96 and 1.07 m.daN). then retorque to required limit without loosening until required torque is maintained.
R (e)Lubricate threads with Material No.P06-054, and connect bleed valve supply manifold to adapter on bleed valve. Tighten and TORQUE tube nut to between 200 and 225 lbf. in. (2.26 and 2.54 m.daN). Wirelock tube nut.
(2)Upper right 2.9 bleed valve (Ref. Fig. 402)
(a)Install gasket on tube adapter. Lubricate adapter threads with Material No.P03-001.
(b)Remove protective closure and install adapter in boss on 2.9 bleed valve. Tighten and TORQUE adapter to between 110 and 120 lbf. in. (1.24 and 1.36 m.daN).

(c)Remove protective closure from boss on right side of HPC rear case at approximately 1 o'clock position and install gasket in groove of boss.
CAUTION : WHEN USING PWA85436 TORQUE ADAPTER THE ACTUAL TORQUE WRENCH READING WILL BE LESS THAN THAT STATED BELOW.
(d)Remove protective closure from bleed valve and install on boss with threaded adapter pointing rearward and slightly upward to align tube with adapter. Secure bleed valve with eight bolts, threads lubricated with Material No.P03-001. Using PWA85436 Torque Adapter tighten and TORQUE bolts to between 85 and 95 lbf. in. (0.96 and 1.07 m.daN) then retorque to required limit without loosening until required torque





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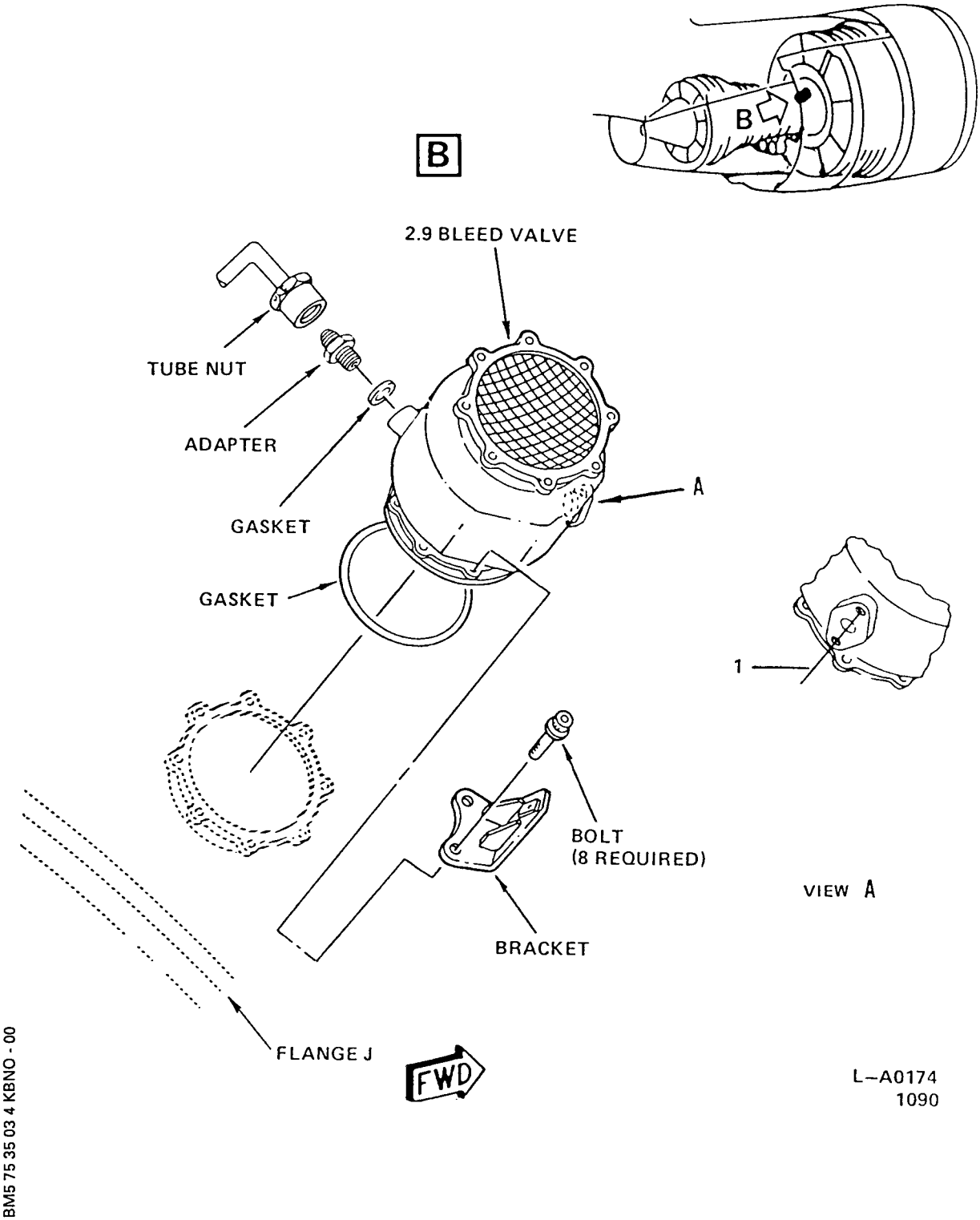
Upper Left 2.9 Bleed Valve
Figure 401



Upper Right 2.9 Bleed Valve
Figure 402

is maintained.

R (e)Lubricate threads with Material No.P06-054, and connect bleed valve supply manifold to adapter on bleed valve. Tighten and TORQUE tube nut to between 200 and 225 lbf. in. (2.26 and 2.54 m.daN). Wirelock tube nut.

(3)Install bleed valve bellows seal (Ref. 75-35-04, P. Block 401).

E. Close-Up and Test

(1)Remove protective closure and install the 2.9 bleed valve thermocouple probes (Ref. 75-35-07, P. Block 401).

(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(3)Remove access platform.

(4)Close thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

(5)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

2. Bleed Valve Screen

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Protective Closures
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-35-04, P. Block 401	2,9 Bleed Valve Bellows Seal

B. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Install access platform.

(3)Remove bleed valve bellows seal (Ref. 75-35-04, P. Block 401).

C. Removal (Ref. Fig. 403)

(1)Remove the screw and washer from the center of the screen and the four screws which secure the screen to the flange of the valve.

(2)Remove the screen and install a protective cover over the bleed valve port.

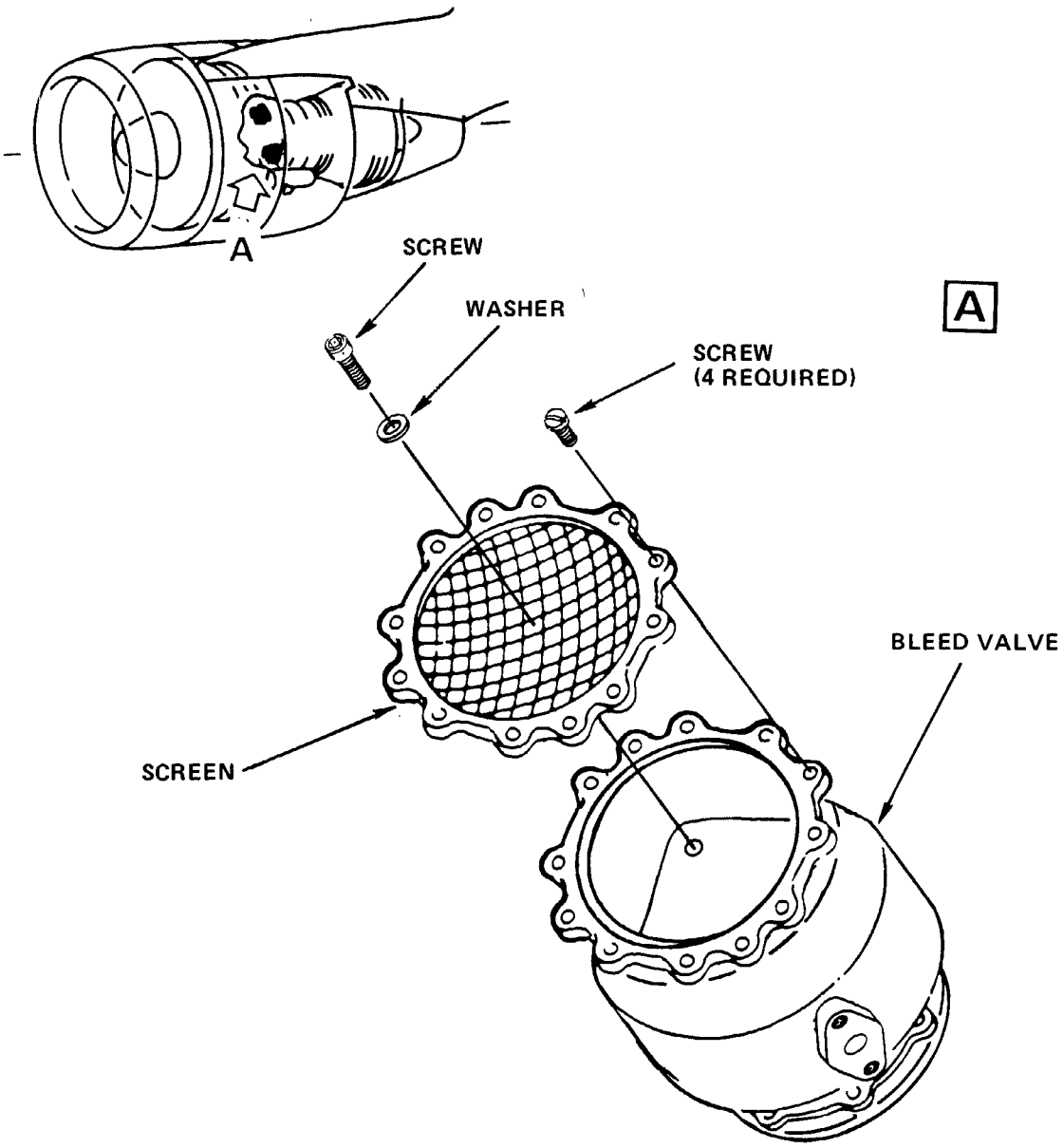
D. Installation (Ref. Fig. 403)

(1)Remove the protective cover from the bleed valve port.

(2)Position the screen on the bleed valve housing and secure it at the flange with four screws. TORQUE the screws to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(3)Attach the screen to the bleed valve housing through the opening in the center of the screen mesh with a screw and a washer. TORQUE the screw to between 25 and 30 lbf.in. (0.29 and 0.33 m.daN).

E. Close-Up
(1)Install bleed valve bellows seal (Ref. 75-35-04, P. Block 401).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Remove access platform.
(4)Close thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. block 301).



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Bleed Valve Screen Removal/Installation
Figure 403

2.9 BLEED VALVE BELLOWS SEAL - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Protective Covers
D.	Torque Wrench
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

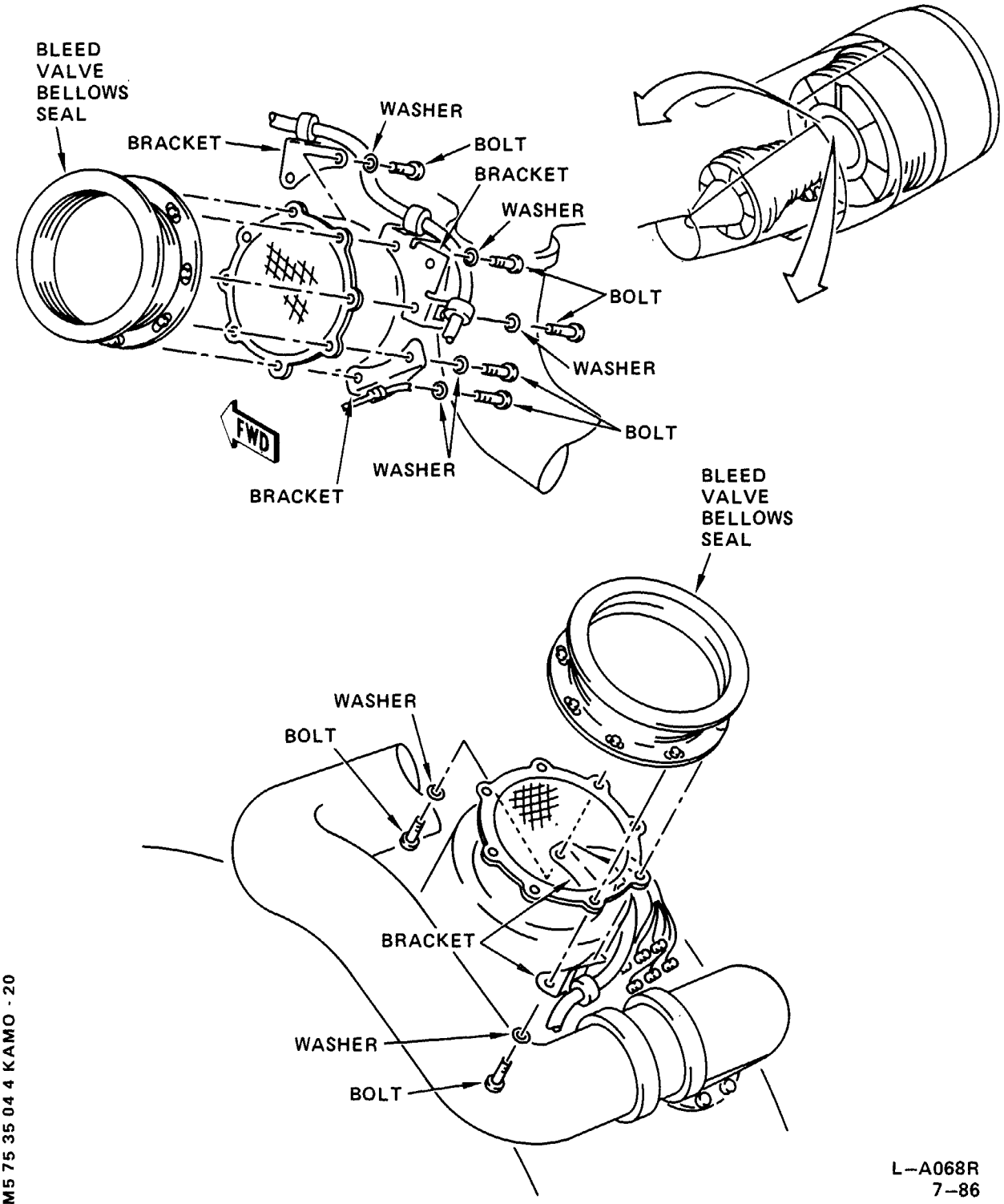
2. Procedure

A. Job Set-Up
(1) Open safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2) Install access platform.

B. Removal (Ref. Fig. 401)
(1) Remove bolts and washers from bellows, brackets and bleed valve making flanges. Remove bellows and install protective cover over bleed valve port.

C. Installation (Ref. Fig. 401)
(1) Remove protective cover over bleed valve port.
(2) Install bellows seal and brackets on bleed valve.
Secure with bolts and washers. TORQUE bolts to between XX and XX lbf.in. (X.XX and X.XX m.daN).

D. Close-Up
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Remove access platform.
(3) Close thrust reverser and fan cowl doors, and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4) Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



Bleed Valve Bellows Seal
Figure 401

START/STABILITY BLEED VALVE SOLENOID - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C. Material No.P06-054	Lubricants (Ref. 70-00-00)
D.	Torque Wrench
E.	Gasket
F.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.A	19KS	332/U70
133VU	ENGINES-ENG1 FADEC SOLENOIDS CH.B	21KS	331/V70
FOR ENGINE 2			
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.A	18KS	332/U71
133VU	ENGINES-ENG2 FADEC SOLENOIDS CH.B	20KS	331/V69

(2)Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal
(Ref. Fig. 401, 402, 403)
(Ref. Fig. 404)
CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE LINER BRACKET CAN BECOME DISCONNECTED. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.
(1)Remove screws/bolts securing liner segment and spacer plate to fan exit case at approximately 5 o'clock position. Carefully remove liner and spacer from case.
NOTE : Engines with the acoustical liners must refer to (Ref. 72-23-05, P. Block 401), for instructions on how to remove these liners.
NOTE : Screws are pre SB PW4 ENG 72-107. Bolts are post SB PW4 ENG 72-107.
NOTE : Classified washers (0-3 required) may have been installed between

liner and front center attachment bracket. Washers are needed for gap requirement, and (when used) are secured with adhesive compound to bracket. During engine operation, liner installation or liner removal, washers may become separated from bracket when screws are removed.
If liner segment is damaged and requires replacement, or classified washers become separated from bracket and/or lost, (Ref. 72-23-05, P. Block 401 for replacement).

(2)Disconnect W4P4 and W5P11 harness connectors from solenoid.
(3)Remove the lockwire and disconnect the (AA35), (AA36) and (AA37) bleed valve supply tube (Ref. Fig. 401, 402, 403) (***//KGM0//***)
(a)Remove the clamp installation and remove the tubes.
(b)Install the protective covers.
(4)Remove the lockwire and disconnect the (AA26) and (AA27) bleed valve supply tubes.
(5)Remove the four bolts (and brackets ; Post SB-PW 4 ENG 75-41 only) that attach the solenoid to the bracket. Remove the solenoid.
(6)Remove the four bolts that attach the bleed valve bracket assembly to the intermediate case.
(7)If solenoid is to be replaced comply with the following :
(a)Place valve on bench with adapter cap up facing operator and solenoids to the right.
(b)Remove two adapters, one plug and gaskets from rear of solenoid.
(c)Remove cap from adapter on top of solenoid. Remove two adapters and gaskets from top of solenoid.
(d)Install protective covers to all openings on solenoid.

C. Installation
(Ref. Fig. 401, 402, 403)
(Ref. Fig. 404)
NOTE : Be sure and use the correct part number W4 wiring harness for replacement. Interchangeability with the start/stability bleed valve solenoid (5 o'clock position) is effected . Refer to IPC and/or SB PW4ENG 73-70 for selection.

(1)If new solenoid is being installed comply with the following :
(a)Place valve on bench with two threaded ports up facing operator and solenoids to the right.
(b)Remove protective closures from all openings on solenoid.
(c)Install two adapters with gaskets, threads lubricated with Material No.P03-001, to two openings on top of solenoid. TORQUE adapters to between 65 and 75 lbf.in. (0.73 and 0.85 m.daN).
(d)Install cap, threads lubricated with Material No.P03-001, to adapter furthest from operator.
TORQUE cap to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN).
(e)Install two adapters, larger adapter in center port, and smaller adapter in furthest port, on rear of solenoid with gaskets, threads lubricated with Material No.P03-001. TORQUE larger adapter to between 150 and 170 lbf.in (1.69 and 1.92 m.daN) and smaller adapter to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN).
(f)Install plug with gasket, threads lubricated with Material No.P03-001, to remaining rear port. TORQUE plug to between 110 and 120 lbf.in.

(1.24 and 1.35 m.daN).

(2)Install the bleed valve bracket assembly to the intermediate case at approximately the 5 o'clock position. Install four bolts, threads lubricated with Material No.P03-001, through the bracket and into the intermediate case. Tighten and TORQUE the four bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(3)Position solenoid to bracket on intermediate case, at approximately the 5 o'clock position, with electrical connectors facing rearward. Attach to case with four bolts, lubricated with Material No.P03-001, and bracket (Post SB PW4 ENG 75-41 only) TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

NOTE : For (Post SBPW4 ENG 75-41) engines, the two clamp bracket bolt holes must align.

(Ref. Fig. 404)

R (4)Lubricate solenoid rear center adapter threads with Material No.P06-054. Install the (AA26) bleed valve supply tube assembly.
TORQUE tube nut to between 225 and 250 lbf.in. (2.54 and 2.82 m.daN).

R (5)Lubricate remaining rear adapter on solenoid with Material No.P06-054. Install the (AA27) bleed valve supply tube to adapter. TORQUE tube nut to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN).

(6)Wirelock two rear tubes and plug.

(7)Install the (AA35), (AA36) and (AA37) bleed valve supply tubes as follows :

(Ref. Fig. 401, 402, 403)

(Ref. Fig. 404)

(a)Lubricate the elbow threads of the (AA35) tube with Material No.P03-001.
Lubricate the remaining (AA35), (AA36) and (AA37) tube nut threads with
R Material No.P06-054.

(b)Install the (AA35), (AA36) and (AA37) tubes and tighten by hand.

(c)Install the clamp arrangements with the bolts lubricated with Material No.P03-001.
TORQUE the clamp bolts to between 36 and 40 lbf.in. (0.406 and 0.451 m.daN).

(d)TORQUE the elbow end of the (AA35) tube to between 90 and 100 lbf.in. (1.016 and 1.129 m.daN).
TORQUE the opposite end of the (AA35) tube to between 65 and 75 lbf.in. (0.734 and 0.847 m.daN).

(e)TORQUE the (AA36) tube at both ends to between 200 and 225 lbf.in. (2.259 and 2.542 m.daN).

(f)TORQUE the (AA37) tube to the relay valve to between 225 and 250 lbf.in. (2.542 and 2.824 m.daN).
TORQUE the opposite end of the (AA37) tube to between 200 and 225 lbf.in. (2.259 and 2.542 m.daN).

(g)Install the lockwire to all the tubes.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(8)Connect W4P4 and W5P11 harness connectors to solenoid (Ref. 70-00-00, P. Block 201).

CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE LINER BRACKET CAN BECOME DISCONNECTED. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.

(9)Install fan exit (inner) liner segment and spacer plate to fan case at 5 o'clock position. Secure with screws or bolts, threads lubricated with Material No.P03-001. TORQUE screws/bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

NOTE : Screws are pre SB PW4 ENG 72-107. Bolts are post SB PW4 ENG 72-107.

NOTE : Classified washers (0-3 required) may have been installed between liner and front center attachment bracket. Washers are needed for gap requirement, and when used, are secured with adhesive compound to bracket. During engine operation, liner installation or liner removal, washers may become separated from bracket when screws are removed.
If liner segment is damaged and requires replacement, or classified washers become separated from bracket and/or lost, (Ref. 72-23-05, P. Block 401 for replacement).

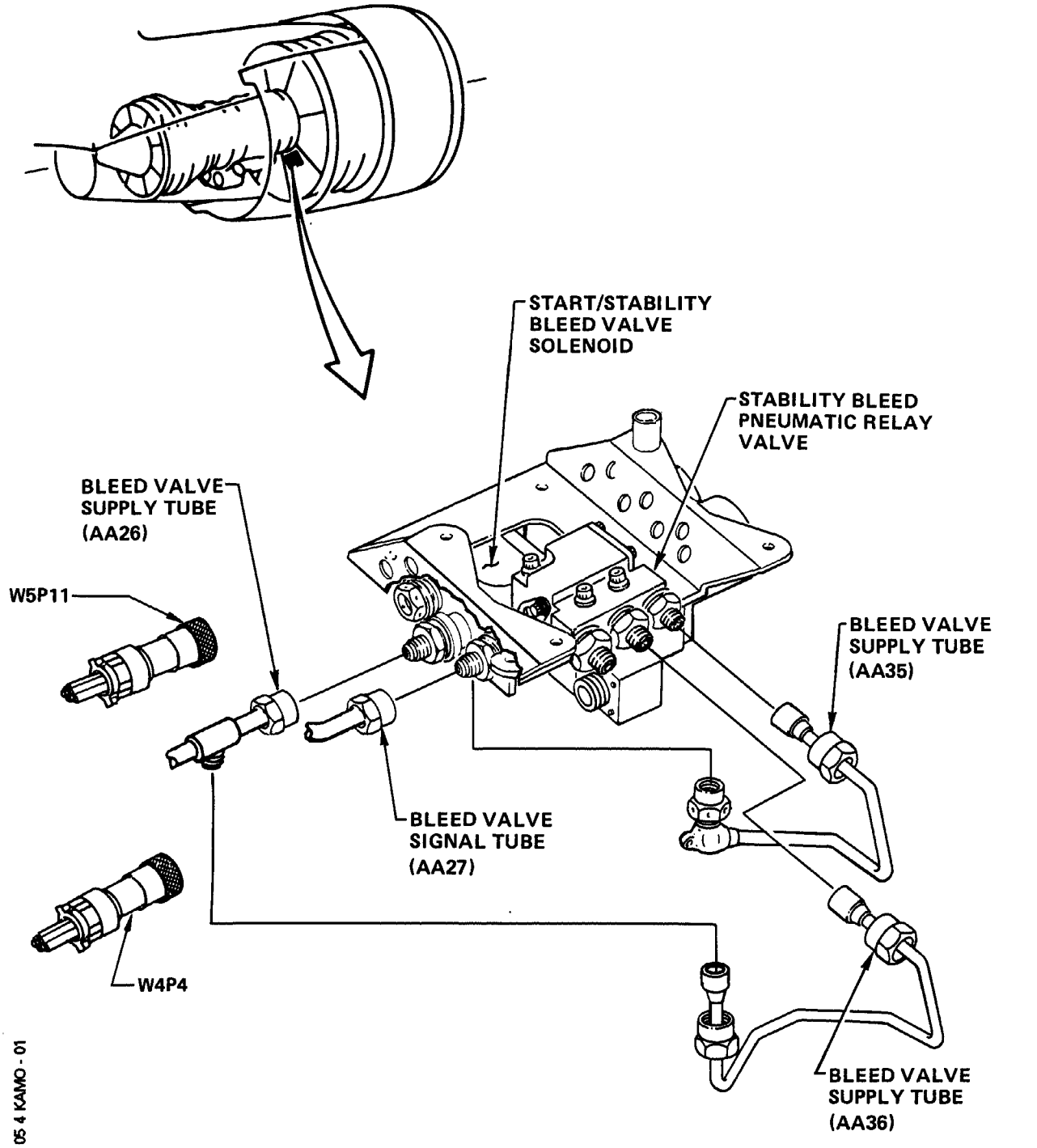
NOTE : Engines with the acoustical liners must refer to (Ref. 72-23-05, P. Block 401), for instructions on how to remove these liners.

D. Close-Up

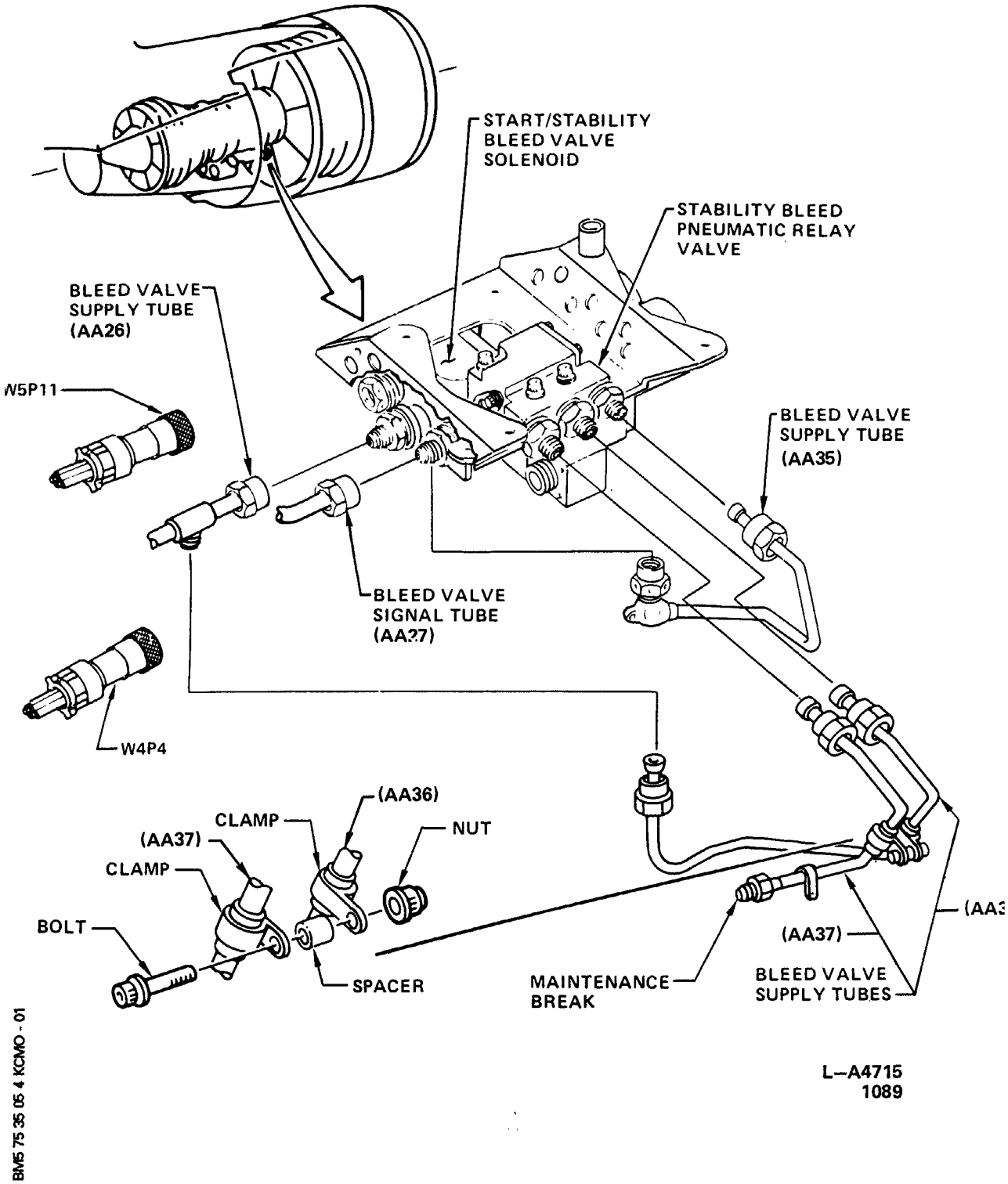
(1)Close thrust reverser and fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

(2)Remove safety clips and tags and close circuit breakers 18KS, 19KS, 20KS, 21KS.

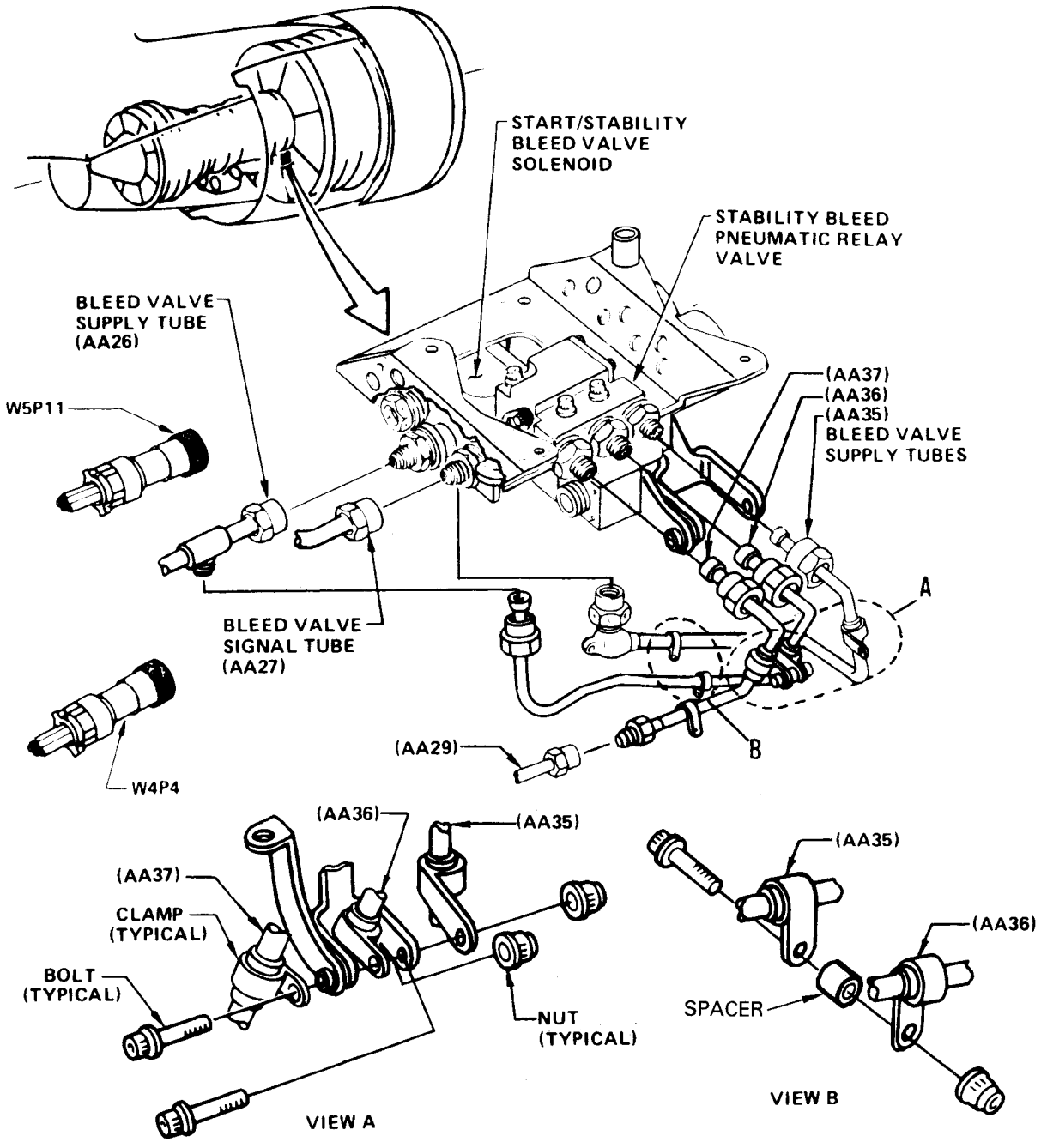
(3)Test engine per Reference Table (Ref. 71-00-00, P. Block 501).



Start/Stability Bleed Valve Solenoid (Pre SB PW4 ENG 75-28)
(Sheet 1/4)
Figure 401



Start/Stability Bleed Valve Solenoid (Post SB PW4 ENG 75-28)
(Sheet 2/4)
Figure 402



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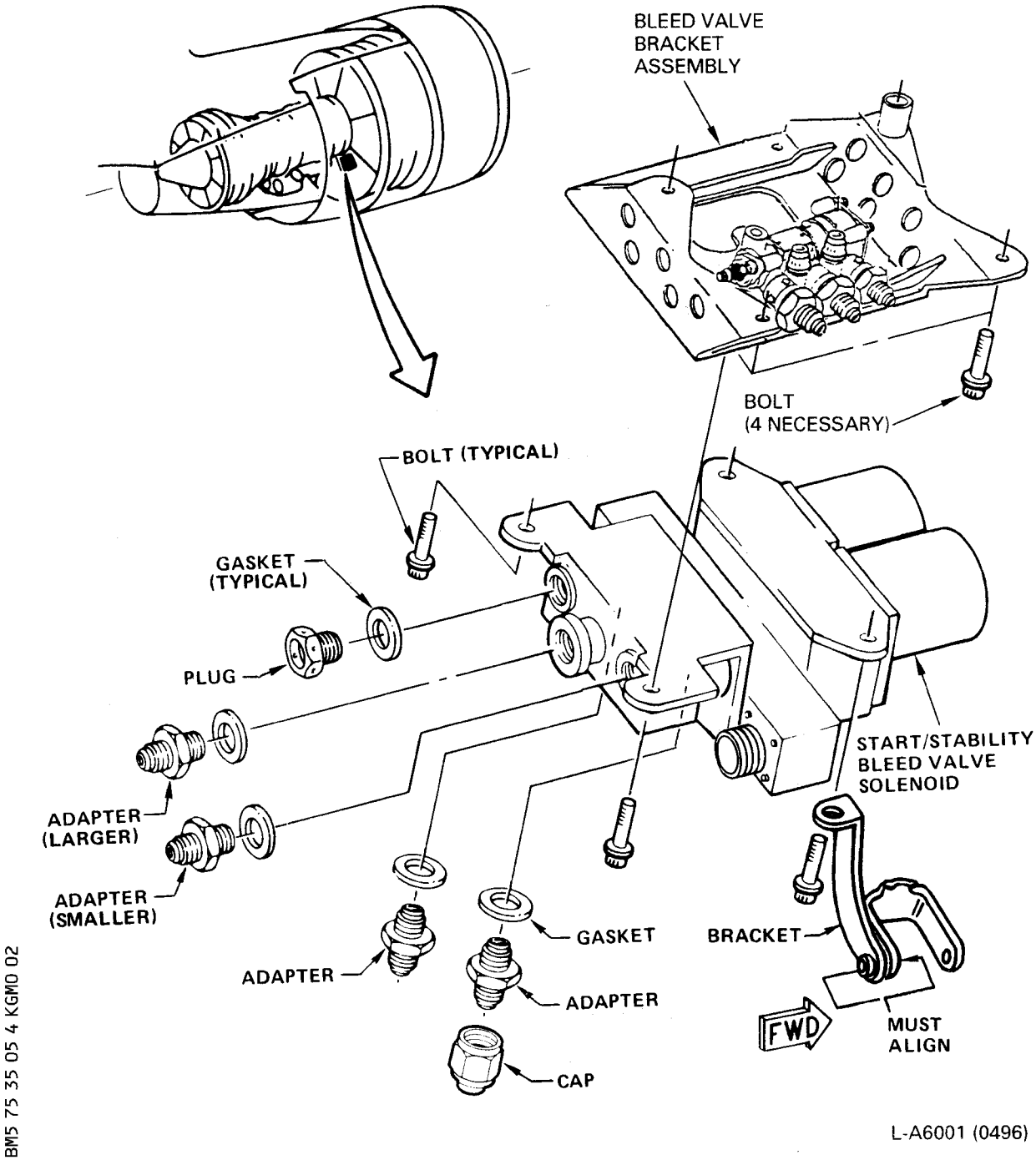
Start/Stability Bleed Valve Solenoid (Post SB PW4 ENG 75-41)
(Sheet 3/4)
Figure 403



BM5 75 35 05 4 KGM0 02

Start/Stability Bleed Valve Solenoid (Sheet 4/4)
Figure 404

STABILITY BLEED PNEUMATIC RELAY VALVE - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
R C. Material No.P06-054	Lubricants (Ref. 70-00-00)
D.	Torque Wrench
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-35-05, P. Block 401	Start/Stability Bleed Valve Solenoid

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan right and thrust reverser right cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1)Remove start/stability bleed valve solenoid (Ref. 75-35-05, P. Block 401).
(2)For engines not equipped with maintenance break (Pre SB PW4 ENG. 75-28), remove lockwire and disconnect remaining (AA37) bleed valve supply tube from relay valve adapter.

(3)Remove three bolts and nuts securing relay valve to the bleed valve bracket assembly at 5 o'clock position. Remove relay valve from bracket. Install protective closures.
(4)If pneumatic relay valve is to be replaced comply with the following :
(a)Remove three adapters and gaskets from valve.
(b)Install protective closures.

C. Installation (Ref. Fig. 401)
(1)If new relay valve is being installed comply with the following :
(a)Remove protective closures from valve.
(b)Install three adapters, threads lubricated with Material No.P03-001, with gaskets to threaded ports.
(c)TORQUE largest adapter to between 150 and 170 lbf.in. (1.69 and 1.92 m.daN). TORQUE middle adapter to between 110 and 120 lbf.in. (1.24 and 1.35 m.daN). TORQUE smallest adapter to betwen 65 and 75 lbf.in. (0.73 and 0.85 m.daN).
(2)Position relay valve on the bleed valve bracket assembly at 5 o'clock position with adapters up and secure with three bolts, threads lubricated with Material No.P03-001 and nuts.
TORQUE bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

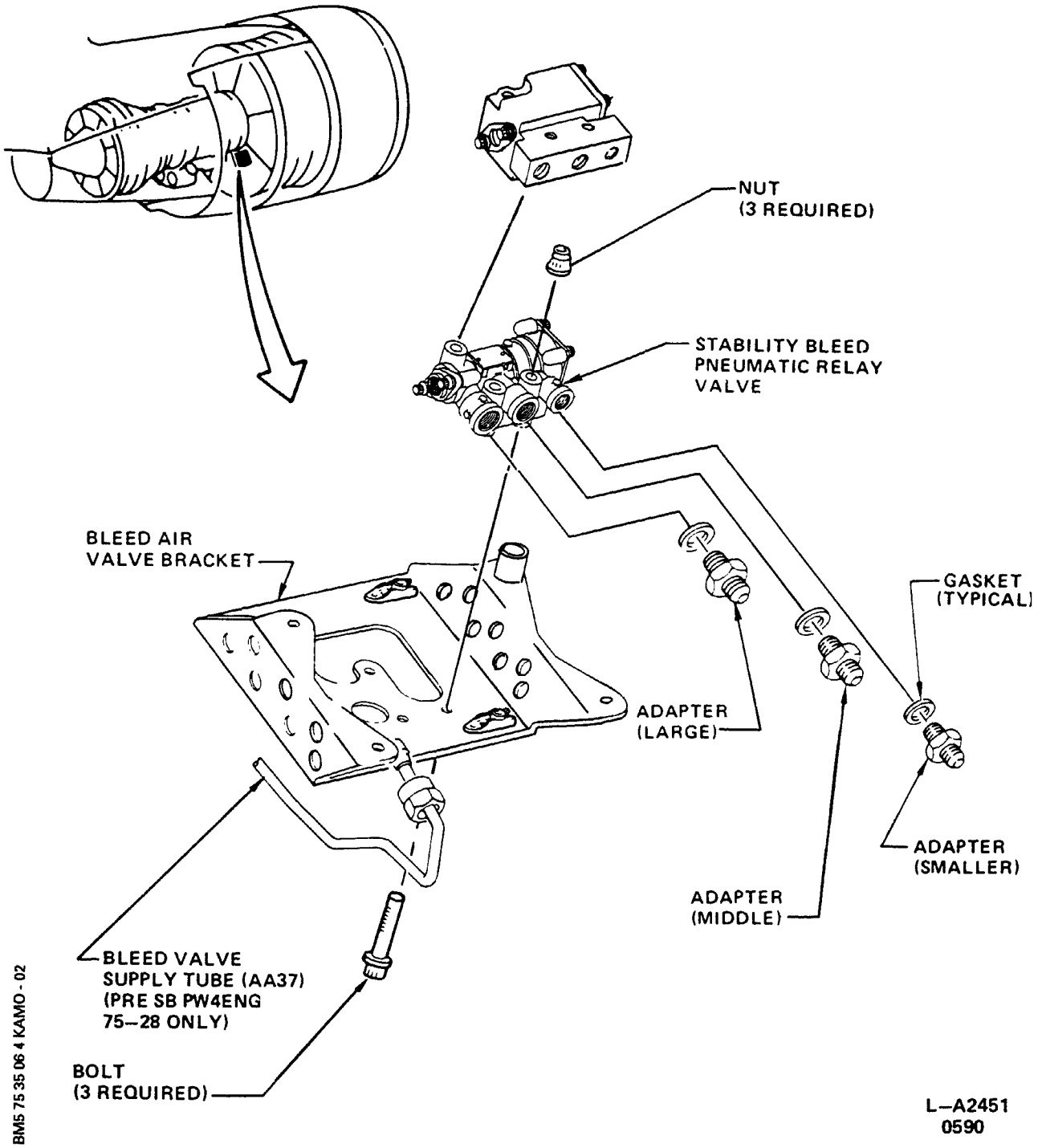
(3)For engines not equipped with maintenance break (Pre SB PW4 ENG. 75-28), install bleed valve supply tube to largest adatper, threads lubricated

R with Material No.P06-054. TORQUE tube nut to between 225 and 250 lbf.in. (2.54 and 2.82 m.daN).
NOTE : Tube is to be wirelocked with installation of start/stability bleed valve solenoid.

(4)Install start/stability bleed valve solenoid (Ref. 75-35-05, P. Block 401).

D. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close right thrust reverser and right fan cowl doors (Ref. 71-13-00, P. Block 301).
(3)Remove safety clips and tags and close circuit breakers.



Stability Bleed Pneumatic Relay Valve
Figure 401

2.9 BLEED VALVE THERMOCOUPLE PROBE - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Access Platform
B.	Circuit Breaker Safety Clips
C.	Protective Covers
D.	Torque Wrench 95 lbf.in. (1.07 m.daN)
E. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
FOR ENGINE 1			
133VU	ENG1/SCU SUPPLY GND	35KS	333/T76
133VU	ENG1/SCU SUPPLY FLT	37KS	333/T75
FOR ENGINE 2			
133VU	ENG2/SCU SUPPLY GND	34KS	333/T85
133VU	ENG2/SCU SUPPLY FLT	36KS	333/T84

(2)Install access platform.

(3)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Remove the 2.9 Bleed Valve Thermocouple Probe (For Engines Equipped Only) (Ref. Fig. 401)

NOTE : Use this procedure for the removal of either the left, the right, or both the thermocouple probes.

(1)Remove the two nuts and the clamp bolt or nut that attach the harness lead to the thermocouple probe and the bracket.

(2)Remove the two bolts, the bracket, and the thermocouple probe from the bleed valve.

(3)Install protection covers.

C. Install the 2.9 Bleed Valve Thermocouple Probe (for Engines Equipped Only) (Ref. Fig. 401)

NOTE : Use this procedure for the installation of either the left, right, or both of the thermocouple probes.

(1)Remove the protection covers.

(2)Install the thermocouple probe and bracket to the port in the bleed valve as shown in the figure. Attach the bracket and probe with the two bolts, lubricated with Material No.P03-001. TORQUE the bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(3)Install the harness to the thermocouple probe with the two nuts. Tighten

by hand.

(4)Lubricate the welded bolt on the bracket with Material No.P03-001. Install the small ground cable and clamp and attach them to the bolt with a clamp nut. TORQUE the clamp nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(5)TORQUE the nut on the larger stud of probe to between 18 and 22 lbf.in. (0.21 and 0.24 m.daN).

(6)TORQUE the nut on the smaller stud on probe to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

D. Close-Up

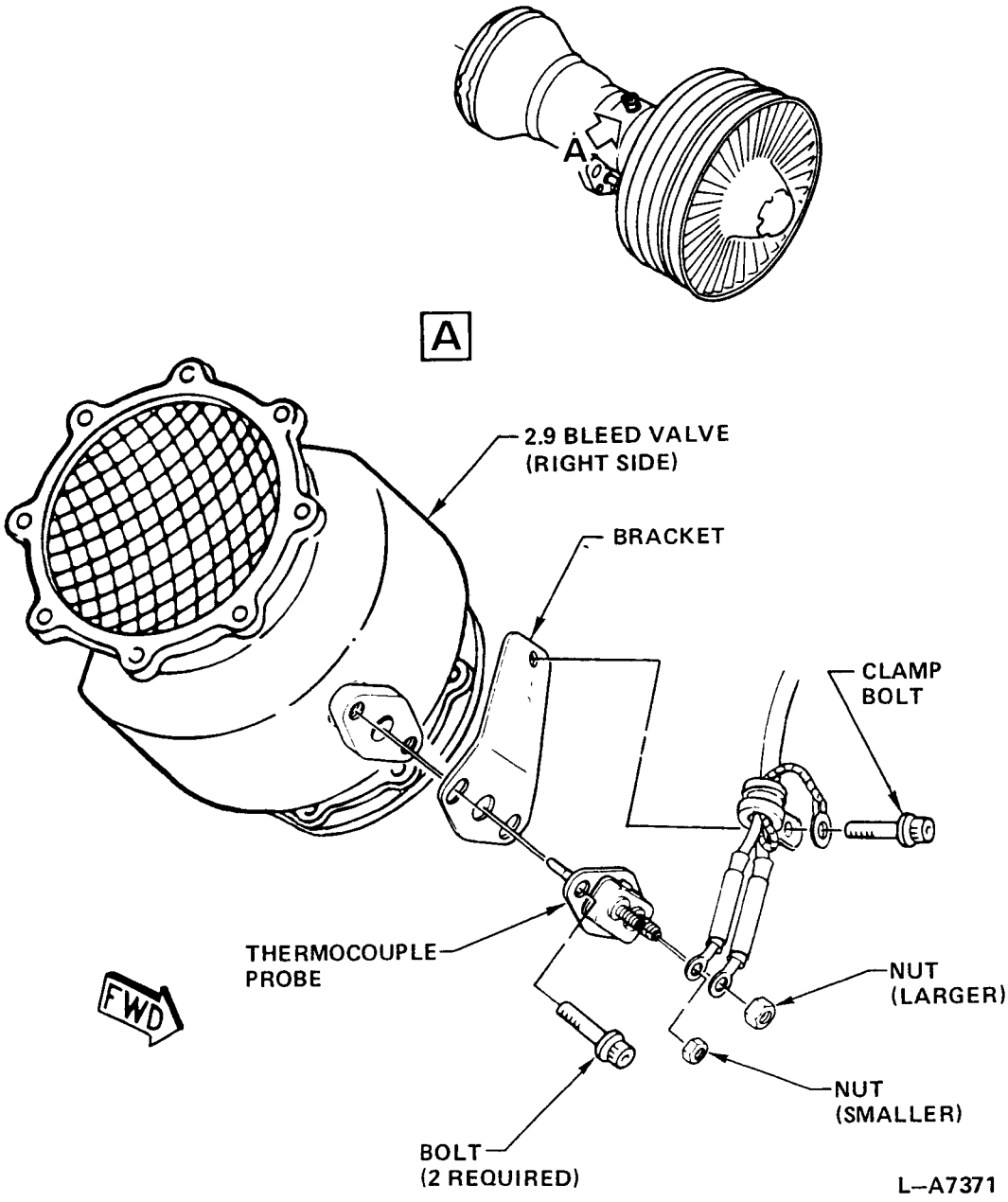
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Remove access platform.

(3)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

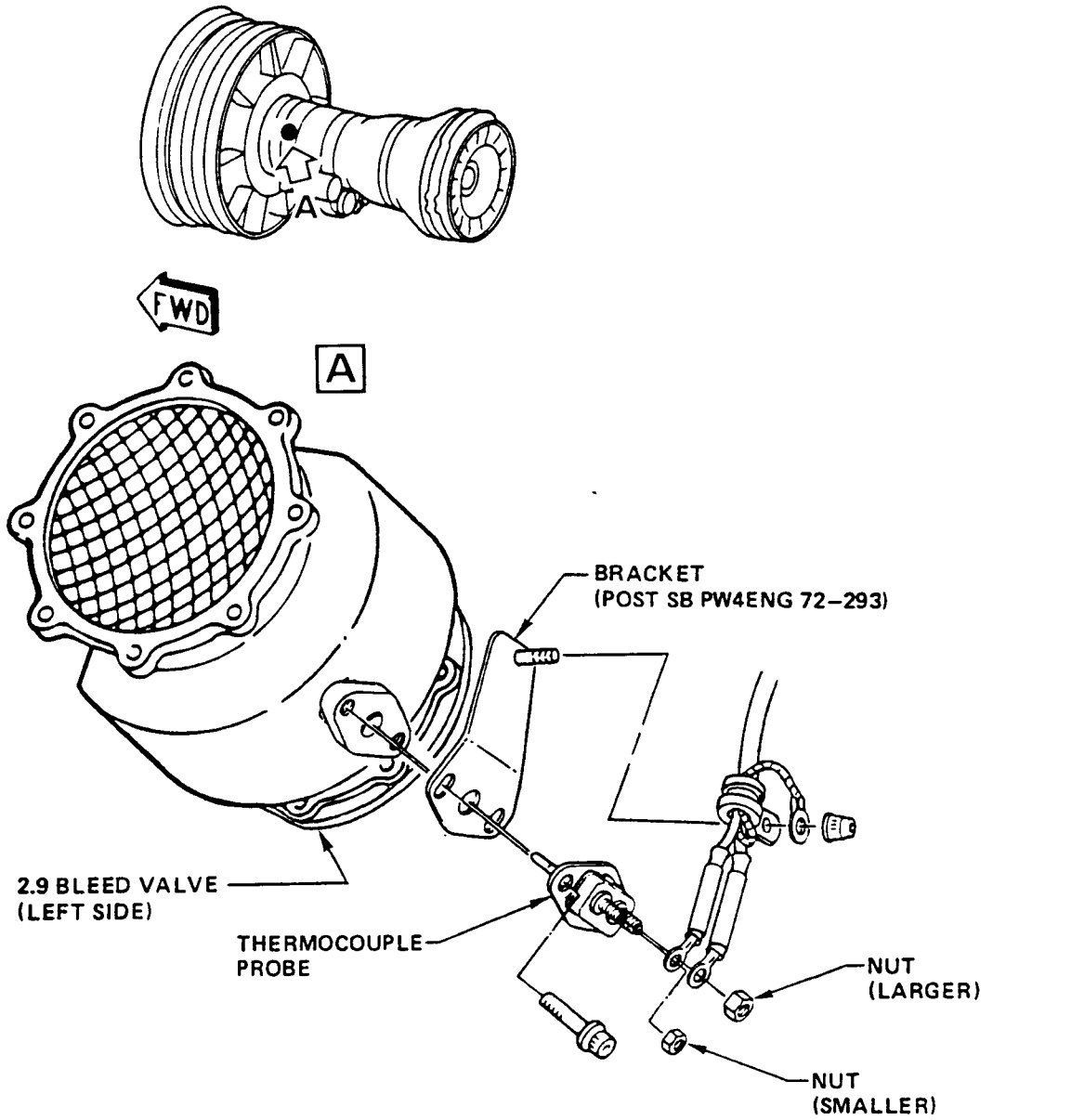
(4)Remove safety clips and tags and close circuit breakers : 35KS, 37KS, 34KS, 36KS.

(Sheet 1/2)
(Sheet 2/2)



BM5 75 35 07 4 KANA - 00

2.9 Bleed Valve Thermocouple Probe (Right Side)
Figure 401

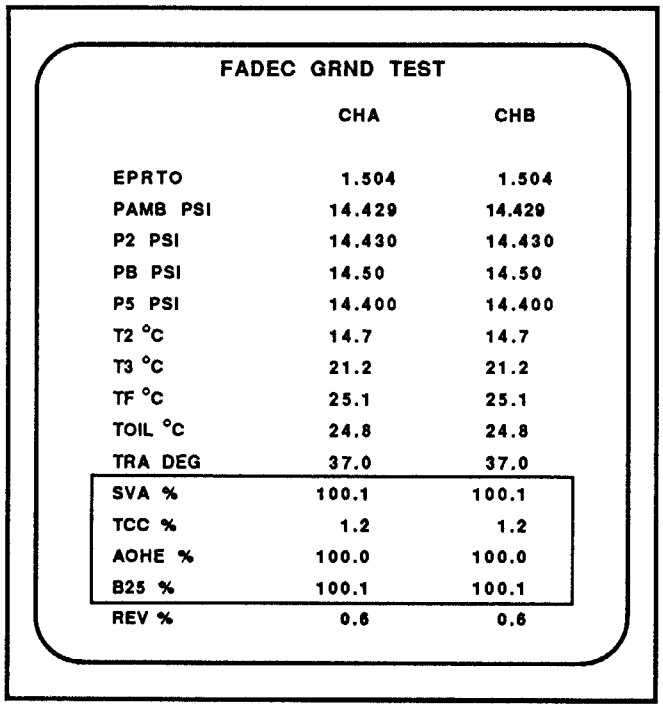


BM5 75 35 07 4 KANJ - 00

2.9 Bleed Valve Thermocouple Probe (Left Side)
Figure 401

1. General (Ref. Fig. 001)
   Except for the nacelle ambient air temperature there is no indication in flight of the operation of the systems here described.
   On the ground, when the **FADEC** ground test is selected the **ECAM** system provides the following indications :
   - stator vane angle position **(SVA)**
   - turbine case cooling valve position **(TCC)**
   - engine air/oil heat exchanger valve position **(AOHEV)**
   - 2.5 bleed valve position **(B25)**

   percent of opening



FADEC GRND TEST

	CHA	CHB
EPRTO	1.504	1.504
PAMB PSI	14.429	14.429
P2 PSI	14.430	14.430
PB PSI	14.50	14.50
P5 PSI	14.400	14.400
T2 °C	14.7	14.7
T3 °C	21.2	21.2
TF °C	25.1	25.1
TOIL °C	24.8	24.8
TRA DEG	37.0	37.0
SVA %	100.1	100.1
TCC %	1.2	1.2
AOHE %	100.0	100.0
B25 %	100.1	100.1
REV %	0.6	0.6

BM5 75 40 00 0 KAMO - 21

R Display - Ground Test
Figure 001

NACELLE TEMPERATURE INDICATING - DESCRIPTION AND OPERATION

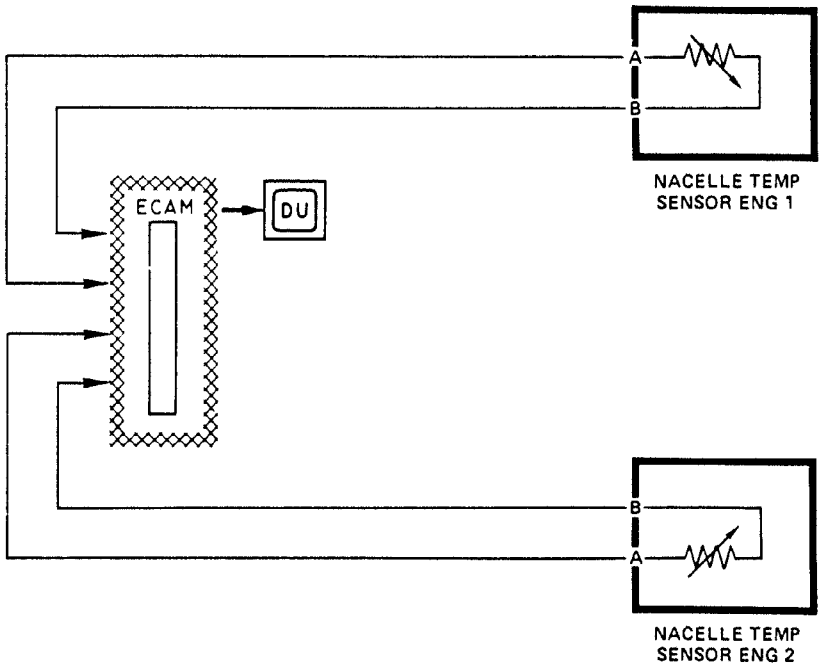
1. Nacelle Air Temperature Indicating (Ref. Fig. 001, 002, 003)

A. Description and Operation

A Lewis temperature sensor installed in the core compartment as shown on the referenced figure (Ref. Fig. 003) provides a signal to the System Data Acquisition Computer (SDAC) which is used to generate a digital message to the Symbol Generator Unit (SGU).

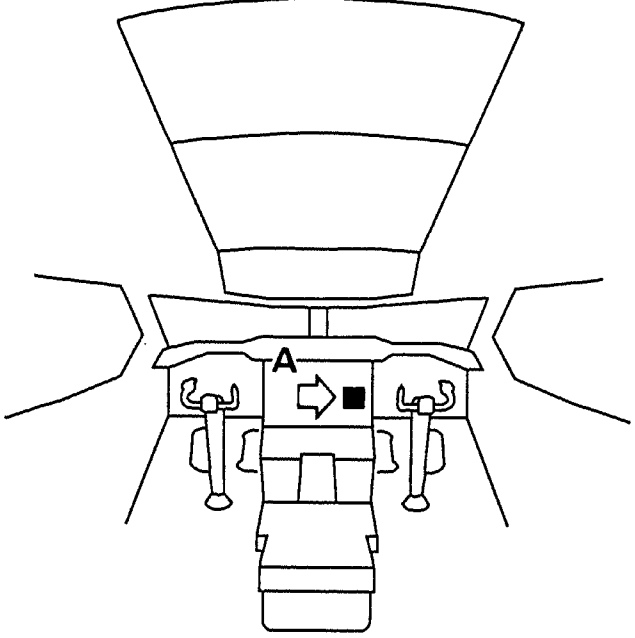
The SGU feeds the R ECAM display unit for continuous temperature indication on the engine page.

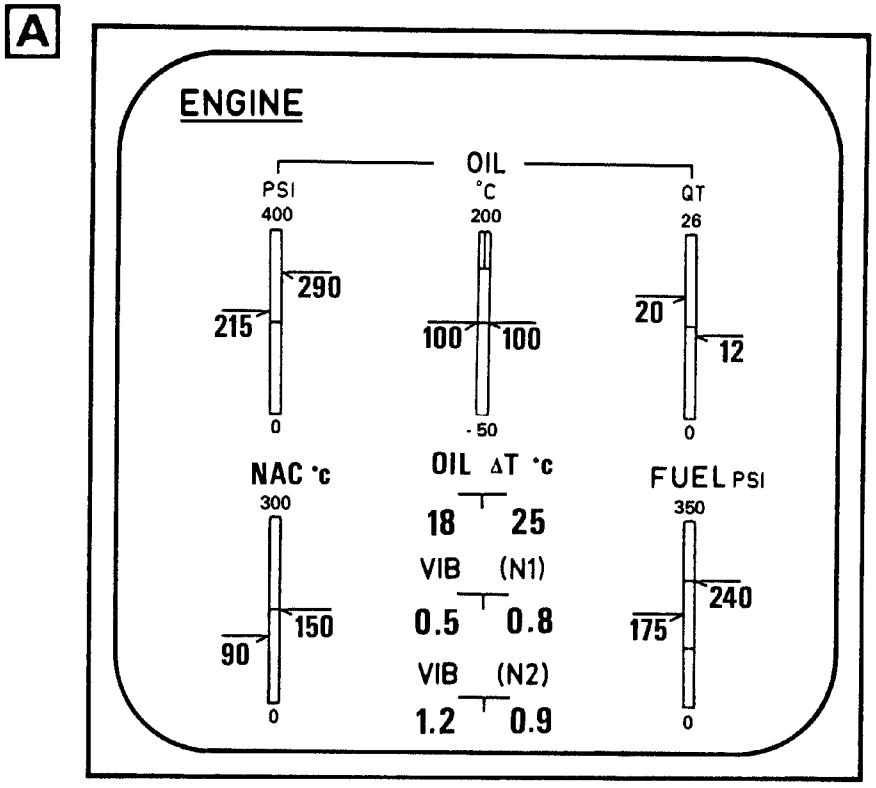
In case the nacelle sensed temperature exceeds 230°C, the system calls for the engine page with a flashing temperature display (advisory) legend, "NAC - TEMP".



BM5 75 41 00 0 KAMO - 21

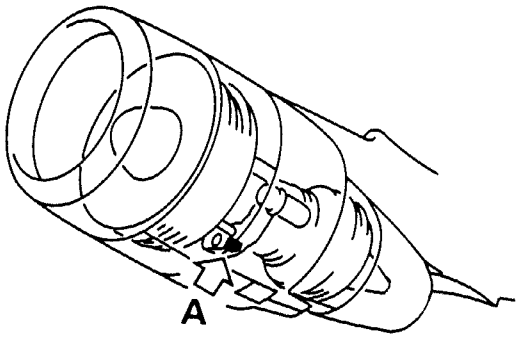
Nacelle Temperature - Schematic
Figure 001

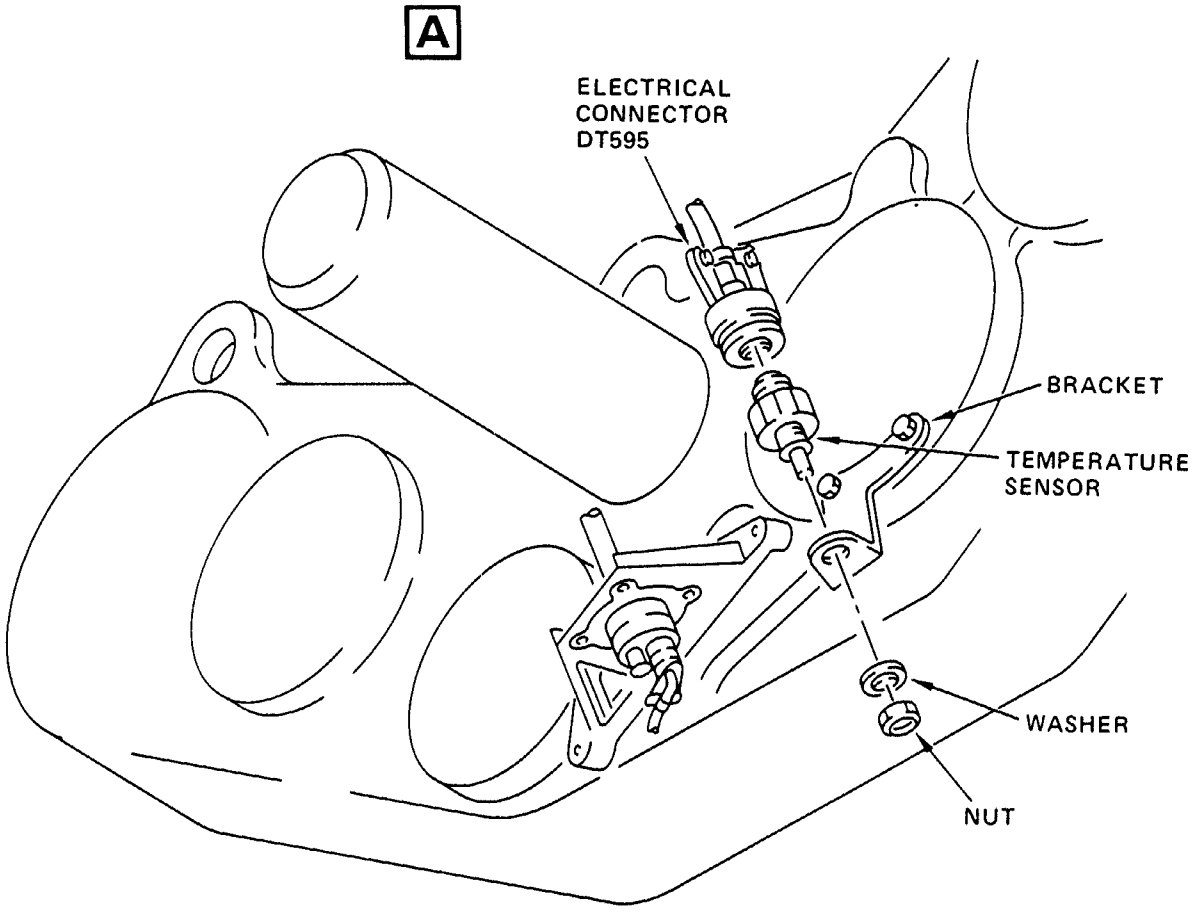




BMS 75 41 00 0 KCMO - 00

ECAM Display Unit - Location in Flight Compartment
and Engine Page
Figure 002





BM5 75 41 00 0 KEMO - 21

L-A054R

Location of Temperature Probe
Figure 003

ENGINE CORE COMPARTMENT TEMPERATURE SENSOR - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Corrosion Resistant Steel Lockwire (MS2099SC32) (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
21VU	ECAM/SDAC 26VAC REF2	3WV2	109/A02
21VU	ECAM/SDAC 26VAC REF3	5WV	109/A03
21VU	ECAM/SDAC PWR SUPPLY	6WV	109/A05

(2)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)

(1)Remove electrical connector from temperature sensor and install protective cover on connector.

(2)Remove lockwire, washer, and nut attaching sensor to bracket and remove sensor.

C. Installation (Ref. Fig. 401)

(1)Install temperature sensor in bracket with washer and nut.

(2)TORQUE nut to between 60 and 70 lbf.in. (0.68 and 0.79 m.daN) and wirelock.

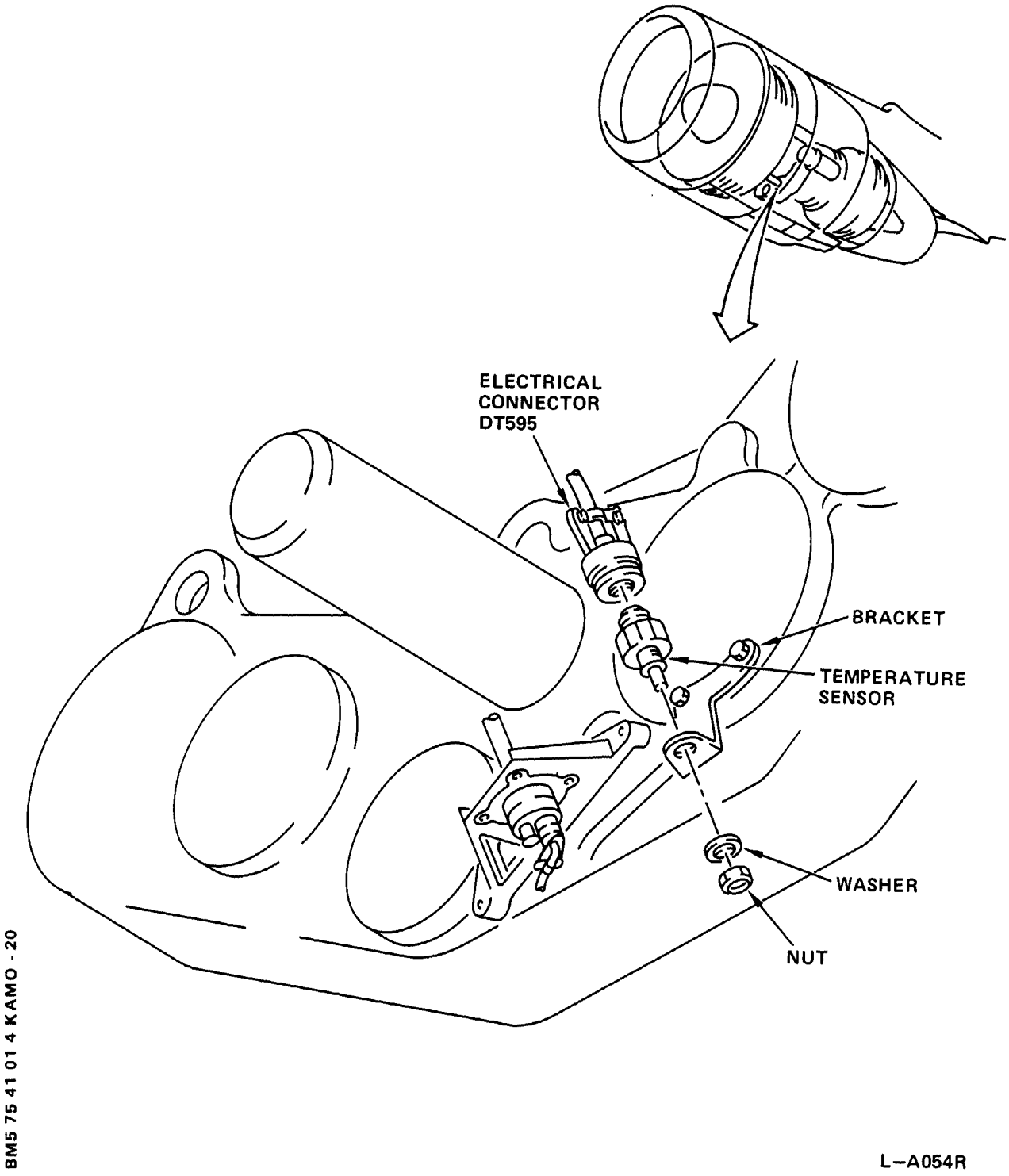
(3)Remove protective cover and install electrical connector DT595 on sensor. Tighten connector fingertight plus one-eighth turn.

D. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(3)Remove safety clips and tags and close circuit breakers : 3WV2, 5WV, 6WV.



Engine Core Compartment Temperature Sensor
Figure 401